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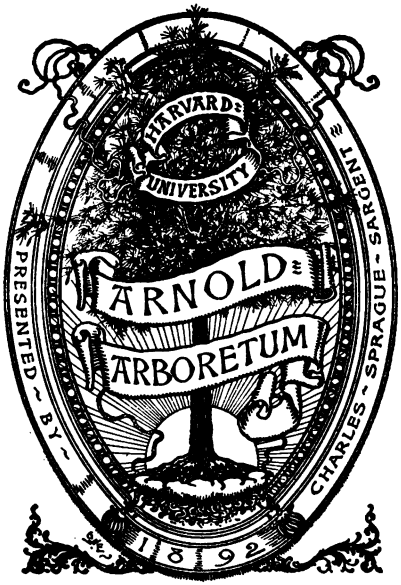
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1892

MUHLENBERGIA

A Monthly Journal of Botany

Editors: A. A. HELLER and P. BEVERIDGE KENNEDY

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Reno, Nevada
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JANUARY, 1909

Editors: A. H. HELLER and P. BEVERIDGE KENNEDY

The Bitter Root (*Lewisia rediviva* Pursh).

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University of Nevada,
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MUHLENBERGIA

STUDIES IN TRIFOLIUM I.

By P. Beveridge Kennedy

Some two or three years ago we became interested in the genus *Trifolium*, with the purpose more especially of attempting to introduce into cultivation some of our excellent annual and perennial species. The literature concerning the clovers seemed to be in so unsatisfactory a condition that little progress could be made along any line of investigation without first inquiring into the validity of the species. We found that some careful and conscientious work was necessary, including much field and culture work before a revision of the genus could be made that would stand the test. Furthermore, it was soon made apparent that thorough work would necessitate the examination and comparison of the types of American species deposited in European herbaria. This we intend to do before publishing the final monograph.

Many friends, however, who have loaned us specimens and aided in other ways, are anxious to know what to do with their clovers, and are awaiting our publication. In view of these facts we intend to take up the various sections in a preliminary way, so as to open our views for discussion.

These discussions could not very well be published in a monograph. Their object will be to try to get as near the truth as possible before presenting any work in a permanent and completed form. We invite discussion and criticism, either by personal letter or for publication. The first papers will include a review of the species belonging to the *Amoria* section found growing spontaneously or under cultivation in America north of Mexico.

The published names that may be taken up for consideration under this section are as follows:

BIFIDUM GROUP

T. bifidum
T. bifidum decipiens
T. Greenei
T. Hallii
T. Breweri
T. gracilentum
T. gracilentum inconspicuum
T. inconspicuum
T. Palmeri
T. exile
T. ciliolatum
T. ciliatum discolor

STOLONIFERUM GROUP

T. stoloniferum
T. reflexum
T. reflexum glabrum
T. virginicum
T. amphianthum

CAROLINIANUM GROUP

T. carolinianum
T. carolinianum villosum
T. saxicola
T. bejariense

INTRODUCED SPECIES

T. hybridum
T. repens

BIFIDUM GROUP

A critical study in the field and of herbarium specimens leads us to believe that *T. bifidum* Gray, *T. Greenei* House, and *T. Hallii* Howell, represent a single species. Attempts to give these names even varietal rank have failed, as there seems to be no definite characters on which to separate them. We have examined two specimens from as far north as Victoria, British Columbia, collected by Fletcher. Then in Washington we have those reported by Piper in his Flora of Washington from along the Columbia river in Klickitat county, and from Seattle by Smith. We have seen specimens from Oregon from both the northern and southern portions not far from the coast. That we do not again find representatives until we get far down into California, may be accounted for by the very meagre collections from the northwestern part of that state. That it follows down the coast much farther than San Francisco Bay is

shown by collections from San Luis Obispo and San Diego by Jones.

Piper in his Flora of Washington recognizes that the Washington plants are the same as at least some of those found around San Francisco Bay, as he makes *T. Greenei* a synonym of *T. Hallii.*

A reading of the descriptions of the leaflets of the different species proposed, indicates a great similarity. The original description of *T. bifidum* Gray, says "leaflets linear-cuneate, lateral ones rarely dentate, bifid or incised at the apex with a mucronate point between the lobes."

The accompanying illustration was prepared from leaflets taken from different specimens in an attempt to show that there is a gradual transition from leaflets which are simply retuse or emarginate to deeply incised ones. We could show the same gradations of variation in the calyx, the most striking being two specimens with long calyx teeth, one from Osage Canyon, Araquipa Hills, Solano county, California, May 2 to 6, 1891, Jepson, the other from Vanden, Solano county, May 7, 1907, Kennedy. But in this same locality we find plants showing the transition stages of both leaflets and calyx teeth.

If we attempt to separate the northern plant and call it *T. Hallii*, we find on the same sheet (E. Hall, 97, Oregon, 1871, Engelmann Herbarium, Missouri Botanical Garden, accession no. 21154, named *T. gracilentum*) obovate leaflets with a retuse apex, and linear leaflets with a notch one-quarter their length.

Plants from around Los Gatos, Santa Clara county, California, with identically the same shape of vexillum, wings, keel, and length of calyx teeth, when they have plenty of room are robust, with simply emarginate mucronate leaves, while if crowded, a hundred plants within a square foot of ground, they are small, with deeply incised leaves. These latter plants were also decidedly more pubescent and hirsute. The entire peduncle is pubescent, and the pubescence also extends to the leaves. The reduction in the amount of leaf surface in the first place, and the increased pubescence in the second, seems to us to be due to an attempt on the part of the plant to adapt itself to conditions

of reduced nutrition and moisture. We are well aware that a reduced amount of leaf surface may take place from two distinctly opposite causes, one in the case of water plants because the surface is not needed to secure food from the air, and the other in the case of perennial desert plants where transpiration must be reduced to the lowest possible amount on account of a scarcity of water at the roots.

We suggest that perhaps the shape of the leaf may be one of nourishment, and hope to substantiate this by means of culture experiments.

We were unable to find the difference in the shape of the vexillum as indicated by House in his paper in Bot. Gaz. **41:** 334 and 335. *f. 1-2.* 1906. The lower lateral edges naturally double under at this point, and flatten out with much difficulty. The vexillum in *T. bifidum* is the same as that shown for *T. Greenei* in *f. 1*, but with a mucronate point.

Our investigations therefore lead us to conclude that we have but one species with many forms, none of which are sufficiently separated by characters distinct enough to be described as varieties. The description should be revised to include leaflets from obovate and emarginate to bifid or deeply incised, with a mucronate point between the lobes. The color of the flower is the same in all, creamy, tinged with rose-pink. The original description has "(annual?)" There is no doubt as to the plant being an annual. The synonymy is as follows:

T. BIFIDUM Gray, Proc. Cal. Acad. **3:** 102. 1864.

T. bifidum var. *decipiens* Greene, Fl. Fran. 24. 1891; not *T. decipiens* Hornem. Hort. Hafn. **2:** 715. 1815.

T. Hallii Howell, Fl. Northwest. Am. 135. 1898.

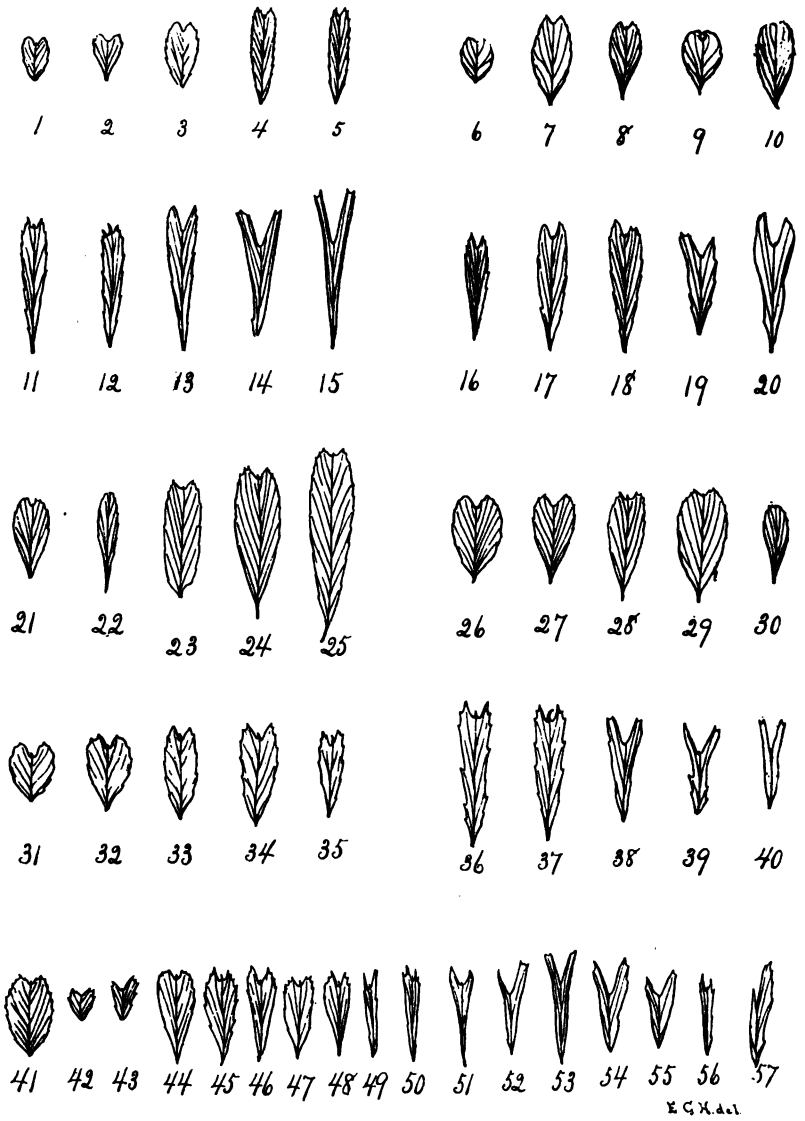
T. Greenei House, Bot Gaz. **41:** 334. *f. 1.* 1906.

The following is the record of the leaflets shown on the plate, the numbers indicating the specimens from which they were taken:

1-5 Silverton, Oregon, *Howell 132.*

6-10 Yamhill county, Washington, *Henderson*, July 8, 1882.

11-15 Osage Canyon, Araquipa Hills, Solano county, California, *Jepson*, May 2-6, 1891.



Variation in the leaflets of *Trifolium bifidum* A. Gray

16-20 Vanden, Solano county, California, *Kennedy*, May 7, 1907.

21-25 Lake Merritt, Oakland, California, *Kennedy*, May 6, 1907.

26-30 Alum Rock Park, Santa Clara county, California, *Heller 8477*.

31-35 Los Gatos, Santa Clara county, California, *Heller 7304*.

36-40 Los Gatos, *Heller 7307*.

41-57 Los Gatos, *Kennedy*, May, 1907.

CALIFORNIA

Specimens examined—Alameda county: Oakland Hills, *Bolander 4804;* Lake Merrit, Oakland, *Kennedy*, May 6, 1907; West Berkeley, May 10, 1893 (no collector); *Kennedy*, May, 1907; Berkeley Hills, *Miss Jones*, April 21, 1901; Charter Hill, Berkeley, *Kennedy*, May 6, 1907; Berkeley, *Miss Walker*, April 18, 1907.

Contra Costa county: Lafayette, *Tidestrom*, April 13, 1895; Mt. Diablo, *Hall 1735;* Antioch, *Mrs. Brandegee*, May, 1907.

Lake county: Lakeport, *Baker 3061*.

Mendocino county: Ukiah, *Bolander 3856*.

Santa Clara county: Alma, *Elmer 3056;* near San Jose, *Smith 1289;* Alum Rock Park, *Heller 8477;* Los Gatos, *Heller 7304, 7307; Kennedy*, May, 1907; Stanford University, *Elmer 2208, 2209* (mixed sheet).

Santa Cruz county: Santa Cruz, *Anderson*, 1869.

San Diego county: San Diego, *Jones 3164*.

San Luis Obispo county: San Luis Obispo, *Jones 2675*.

San Mateo county: San Mateo, *Heller 8559;* Woodside, *Baker 743;* Portola, *Elmer 4714, 4798;* King's Mountain, *Abrams 2470*.

Solano county: Elmira, *Heller*, June 9, 1908; Vanden, *Kennedy*, May 7, 1907; Osage Canyon, Araquipa Hills, *Jepson*, May 6, 1901.

Sonoma county: Santa Rosa, *Heller and Brown 5293*.

Upper Sacramento Valley, *Jepson*, April 24-May 1, 1899.

OREGON

Benton county: Corvallis, *Miss Mulford*, May 31, 1892.

Marion county: Silverton, *Howell 132*.

Polk county: Monmonth, *Spillman 50; Thornton*, May 30, 1893.

WASHINGTON

King county: Seattle, *Smith*, May 29, 1889.

Yamhill county: *Henderson*, July 8, 1882.

BRITISH COLUMBIA

Victoria, *Fletcher 2264, 5205*.

T. BREWERI Wats. Proc. Am. Acad. **11**: 131. 1876.

The original description of this very distinct species was made from one of the slender forms, as it describes an *annual*, very slender and diffuse. Personal observation of it in the field in Plumas county, California, where it grows in dense mats under the pines, proves it to be a stout prostrate perennial, not particularly slender. The plants from Yosemite Valley and vicinity are more slender and fewer flowered than the Sierra and Plumas county specimens.

Lojacono, in his paper entitled "Revisione dei Trifogli dell' America Settentrionale," in Nuovo Giorn. Bot. Ital. **15**: 143, extends the distribution of the Mexican *T. amabile* H. B. K. by including one of these stout forms of *T. Breweri* sent to him by Lemmon from Sierra Valley. Two plants, probably of the same collection, and similar to the one Lojacono mistook for *T. amabile*, are labeled Sierra county, Lemmon, 1875, nos. 51 and 60.

CALIFORNIA

Specimens examined—Butte county: *Parry*, 1859; Colby, *Mrs. Austin 705*.

Calaveras county: Big Trees, *Hansen 350;* Calaveras Grove, *Hall and Chandler 4787; Redfield*, 1872.

Mariposa county: Hog Ranch road, Yosemite Park, *Hall and Babcock 3395;* Yosemite Valley, *Grant 4374h*.

Plumas county: Prattville, *Jones 7448, 7450;* Big Meadows, *Mrs. Gulling*, 1905; Taylorville, *Heller and Kennedy 8770*.

Sierra county: *Lemmon 51, 60*, 1875.

OREGON

Josephine county: Siskiyou mountains, *Cusick 2920;* by creeks, Waldo, *Howell 1112.*

The glabrous species of this group are represented by two widely distributed species, *T. gracilentum* T. & G. and *T. ciliolatum* Benth. The original description of the former by Torrey and Gray seems to be good, but the plant is quite variable as to the size of the flowers and the comparative distance that the vexillum exceeds the calyx teeth. We find also a considerable variation in the breadth and length of the calyx teeth. The vexillum, wings and keel, are frequently tipped with cream-white, the remainder of the flower being some shade of purple, usually bright. The reflexed character of the flowers in the head at maturity is omitted from the original description. The legume is more frequently two than one-seeded.

T. GRACILENTUM T. & G. Fl. N. A. **1:** 316. 1838.

T. denudatum Nutt. Journ. Acad. Phila. II. **1:** 152. *pl. 24.* 1848.

CALIFORNIA

Specimens examined—Alameda county: Oakland, *Jones 7475 Michener and Bioletti 91;* Lake Merritt, Oakland, *Kennedy 1738;* Berkeley, *Davy 825; Hall*, April 20, 1900; Charter Hill, Berkeley, *Kennedy 1739;* West Berkeley, *Kennedy 1740.*

Contra Costa county: Lafayette, *Tidestrom*, April 13, 1895; Antioch, *Mrs. Brandegee*, May, 1907.

Kern county: Mojave, *7761*, Kern Canyon, *7660 Heller;* Caliente, *Trelease*, April, 1892 (mixed sheet).

Los Angeles county: Pomona, *Barber 147;* Saugus, *Grant 1320c;* Pasadena, *Grant 1318;* Inglewood, *Abrams 256, 3248;* plains, *Hasse*, April, 1892; Avalon, Santa Catalina Island, *Mrs. Trask*, May, 1897; *Kennedy 1733; Fritchy*, March 30, 1899.

Monterey county: Pacific Grove, *Heller 6629; Kennedy 1734.*

Napa county: Calistoga, *Baker 1985.*

Riverside county: Banning, *Jones 7492, 7495;* Winchester, *Hall 439.*

Santa Barbara county: Santa Rosa ranch, near Lompoc, *Kennedy 1741.*

San Bernardino county: *Parry and Lemmon 66;* San Bernardino, *Kennedy 1737.*

Santa Clara county: Gilroy, *Baker 1943; Elmer 4902;* Stanford University, *Baker 612, 672, 721; Elmer 4836;* Los Gatos, *Kennedy 1736; Heller 7378.*

Santa Cruz county: Santa Cruz, *Heller*, April 9, 1903.

San Diego county: San Diego *Jones 3164;* Jamul Valley, *Orcutt*, April 5, 1889; San Diego, *Brandegee*, April, 1905; Chula Vista, *Grant 1318;* Fallbrook, *Abrams 3324.*

San Francisco: *Jones 7456;* near San Francisco, *Kellogg and Harford 134.*

San Joaquin county: Stockton, *Reid*, May, 1892.

San Luis Obispo county: San Luis Obispo, *Jones 2675; Mrs. Summers*, April 26, 1882.

Solano county: Vanden, *Kennedy 1735;* Cordelia, *Heller*, April 25, 1902.

Sonoma county: Fort Ross, April 23, 1903, Santa Rosa, June 2, 1902, *Heller;* Healdsburg, *Heller and Brown 5242.*

North Pacific coast, *Parry*, 1887 and 1888.

T. GRACILENTUM var. INCONSPICUUM Fernald, Zoe **4**: 380. 1894.

T. inconspicuum Heller, Muhlenbergia **1**: 135. 1906.

The plant becomes fully as large as *T. gracilentum*, as may be seen in Parish's 5220 and 5628, and in our specimens collected April 24, 1907, near San Bernardino, the type locality. Fernald's original description calls for a plant 2-6 inches high. Along the macadamized roads near San Bernardino in places it is very abundant and stunted on account of lack of moisture and the poor nutritive properties of the crushed rock in which it is growing. In more advantageous places it grows to a good size. Both the species and the variety may be found growing in close

proximity. The flowers are inconspicuous and of a much paler hue than those of *T. gracilentum.* The calyx teeth are more slender, as long and sometimes much longer than the flowers. A critical examination of the sheets of *T. gracilentum* shows that there is a variation within the species from prominent dark purple, white tipped flowers, which are twice the length of the calyx, to very pale purple or greenish-white flowers barely the length of the calyx.

CALIFORNIA

Specimens examined—Los Angeles county: Pasadena, *Jones 3218.*

San Bernardino county: San Bernardino Valley, *Parish 5220, 5628; Kennedy*, April 24, 1907.

T. GRACILENTUM var. **exile** (Greene)

T. exile Greene, Pittonia **1**: 6. 1886.

Type locality, island of Santa Cruz, California, Greene, July and August, 1886.

An examination of Doctor Greene's material while in Washington inclined me to believe that *T. exile* was not entitled to specific rank. It is too near a depauperate form of *T. gracilentum.* The original description of the latter calls for a one-seeded pod, but we know, however, that it is more frequently two than one-seeded. *T. exile* has a two-seeded pod.

A specimen in the Brandegee Herbarium, University of California, named *T. exile*, collected by T. S. Brandegee on Santa Cruz Island in 1888, is certainly *T. gracilentum.*

Orcutt's no. 1004 from Tia Juana, Lower California, mentioned by Fernald in the original description of *T. gracilentum* var. *inconspicuum* seems to be intermediate between that variety and var. *exile.* The variety *exile* may be distinguished by the minuteness of the plant, the small wedge shaped leaves with markedly dentate spinulose margins, and the inconspicuous flowers.

T. PALMERI S. Wats. Proc. Am. Acad. **11**: 132. 1876.

This species is extremely interesting on account of its leaves.

The flowers are much the same as in *T. gracilentum*, but the leaves have no resemblance to it whatever. If we were to hold fast to the views of many, and indeed it must be admitted that it has been our own, that in order to have species we must find characters in the flower or fruit, then we must reduce this to a variety, but when we consider the striking characters of the leaves we are obliged to recognize their importance as a structural difference in this case, and give it specific rank.

The plant from Santa Catalina Island has linear-lanceolate leaves, while those of the type from Guadalupe Island are oblong-lanceolate, acute at each end, with spinulose-serrate margins and a mucronate apex.

A note on one of the sheets of the type collection says: "Rather abundant among rocks and trees on hillsides. Flowers whitish with red center, becoming redder on the edges."

LOWER CALIFORNIA

Specimens examined—Guadalupe Island, *Palmer 26; Franceschi 27.*

CALIFORNIA

Los Angeles county: Santa Catalina Island, *Mrs. Trask*, March, 1896.

Ventura county: San Nicholas Island, *Mrs. Trask 37* and April, 1897.

T. CILIOLATUM Benth. Pl. Hartw. 304. 1848.

T. ciliatum Nutt. Journ. Phila. Acad. II. **1**: 152. 1848; not Clark.

T. ciliatum var. *discolor* Loja. Nuovo Giorn. Bot. **15**: 146. 1883.

Bentham in his original description gives the valley of the Sacramento, and between San Miguel and Santa Barbara as the type localities for his plant, while Nuttall's plant came from Los Angeles. The species can readily be recognized by the character of the calyx teeth, which are scarious and lacerate-ciliate. Its distribution seems to be from Oregon to Lower California. Bentham does not state the color of the flowers, and Nuttall says they are "ochroleucous." Our observation of it in the field in-

dicates that it varies from very light purple tinted to rose-red when fresh, and at maturity or when dry, usually yellowish.

A plant collected by Mrs. Elwood Cooper, of Elwood, near Santa Barbara, California, in the Santa Inez mountains, was sent by Watson to M. Lojacono, of Palermo, Sicily, who described it as var. *discolor*. Although we have not seen this specimen, we have visited the region of the type, and were not able to find any distinct variations in the plant as it grows there. There is also nothing in the description of the variety but that can be found in any large collection of the species. It varies very considerably as to the size of the plant. For example, a plant collected by J. A. Reid in rich soil around Stockton, California, has leaflets 45 mm. long by 16 mm. wide, with flowering heads 20 mm. in diameter, while a plant collected on the Mokelumne river by Hansen has leaflets 14 mm. long, 4 mm. wide, with flowering heads 10 mm. in diameter. The specimens range between these two extremes. Another plant collected by Heller has medium sized leaves with heads 25 mm. in diameter.

CALIFORNIA

Specimens examined—Alameda county: Berkeley, *Hall*, April, 1899, *Michener and Bioletti*, May 8, 1892; *Miss Walker*, April 18, 1907; Berkeley Hills, *Tracy 660*.

Amador county: *Hansen 21*, *360*.

Butte county: *Mrs. Austin 64;* in fields, *Mrs. Bruce 2424;* Berry canyon, *Heller 5500*.

Fresno county: Pine Ridge, *Hall and Chandler 79*.

Kern county: Kern Canyon, *Heller 7770*.

Los Angeles county: Los Angeles, *Jones 7476;* near Los Angeles, *Hall*, April, 1903; Inglewood, *Abrams 257*, *3247;* Pasadena, *Fritchy 84*, *Grant 1314*, *Jones 7477;* McPherson, *Fritchy 29;* plains, *Hasse*, April, 1891; Avalon, Santa Catalina Island, *Mrs. Trask*, May, 1897.

Mendocino county: Ukiah, *Bolander 142*.

Monterey county: Tessajara Hot Springs *Elmer 3295;* on Salinas road near Del Monte, *Heller*, May 8, 1903.

Riverside county: Temecula creek, *Hall 487*.

Santa Barbara county: Near Santa Barbara, *Mrs. Bingham 107;* Santa Rosa ranch near Lompoc, *Kennedy 1728;* Elwood, *Kennedy 1730*, *Eastwood 11;* Santa Barbara, *Elmer 3824*.

San Bernardino county: San Bernardino, *Kennedy 1729*; *Parish 822*, *6027*, and April, 1899; foothills, *Parish*, May, 1888; Fredalba, *Heller 8946*.

Santa Clara county: Stanford University, *Bakcr 871*, *608;* Gilroy, *Baker 1949;* Alma, *Elmer 2924;* Los Gatos, *Heller 8506*, *Kennedy 1731*, *Smith 1285*.

Santa Cruz county: Santa Cruz, *Jones 2329*.

San Diego county: San Diego, *Pringle 4475;* Chollas, *Orcutt 691*.

San Joaquin county: Stockton, *Reid*, May, 1892.

San Luis Obispo county: Rich Valley, *Mrs. Summers*, April 26, 1886.

San Mateo county: Portola, *Elmer 4789*.

Solano county: Near Vacaville, *Heller aud Brown 5393;* Gate's Canyon, near Vacaville, *Heller*, April 27, 1902; Vanden, *Kennedy 1732*.

Sonoma county: Healdsburg, *Heller 5244;* hills east of Santa Rosa, *Heller and Brown 5213*.

California, *E. Hall*, 1866.

NORTHERN LOWER CALIFORNIA

Vallecito, *Orcutt 1367*.

OREGON

Josephine county: Grant's Pass, *Howell*, June 20, 1884, *Gorman;* Rogue river, Grant's Pass, *Henderson*, June 20, 1886.

Wasco county: Hood river, *Sheldon 12186*, *12172*.

Oregon, *E. Hall 96*.

THE BITTER ROOT

By A. A. Heller

On the 21st day of May, 1804, Captain Meriwether Lewis and Captain William Clark, with a hardy company of twenty-six young men set sail up the Missouri river from their camp above St. Louis, the objective point being the mouth of the Columbia river. The journey was comparatively easy and pleasant during the first stages, enlivened by frequent halts to hold councils with the different Indian tribes, with plenty of game to be had for the taking, and no special hardships to overcome.

They wintered among the Mandans in the present state of North Dakota, resuming the journey on April 8, 1805, and on August 13th reached the watershed between the Missouri and the Columbia. On the headwaters of the Missouri hardships and adventures came thick and fast. Game was often scarce, mosquitoes were anything but scarce, canoes were upset, fierce grizzly bears had to be reckoned with, and altogether life was what we are accustomed to call "strenuous."

They reached the mouth of the Columbia on December 3d, establishing winter quarters at Fort Clatsop near the site of the present town of Astoria, Oregon. Here they remained until March 23, 1906, when the homeward march was begun over practically the same ground as on the outward trip.

Among other things President Jefferson instructed Captain Lewis to note the food plants of the Indians and the "date at which particular plants put forth flowers and leaves." The instructions were carried out remarkably well considering the circumstances, else this sketch had not been written.

On July 1, 1806, they had again overcome the perils of the Bitterroot mountains and were on their eastern slope. Here, near the junction of Lo Lo creek with the Bitterroot river, in Missoula county, Montana, southwest of Missoula, Captain Lewis collected the handsome plants which were to commemorate his name among botanists, and to furnish the state flower for the future great state of Montana, as well as lend its name to the wild and rugged ranges where it was first found.

Upon the return of the expedition, the botanical specimens together with the notes concerning them, were turned over to Frederick Pursh, one of the foremost botanists of that time, who described many of them as new in his Flora Americae Septentrionalis, published in 1814, and among them the new genus and species *Lewisia rediviva*, published in volume 2, page 368.

In Lewis' notes it is stated that "the Indians eat the roots of this." The following interesting note occurs in Torrey and Gray, Fl. N. A. **1:** 678:

"The plant is called *Spatulum* or *Spaet'lum* by the natives, who gather the roots and employ them largely as an article of food. The bark being stripped off, the white inner portion is boiled in water, when it forms a substance similar to *Salep* or boiled Arrow-root. The dead root, according to Nuttall, almost dissolves into starch by maceration in cold water. The roots are so tenacious of life, that specimens in Lewis's herbarium, as Pursh records, showing some signs of vegetation, were planted in a garden at Philadelphia, where they grew for a year; and Douglas's specimens, treated in the same way, vegetated for a short time in the garden of the London Horticultural Society."

In Zoe **3:** 109, F. D. Kelsey writes as follows concerning it as he found it on the main range of the Rocky mountains, fifteen miles from Helena, Montana:

"*Lewisia rediviva*,, locally called 'Bitter-root,' was blooming profusely. It is a portulaca, with linear fleshy leaves lying flat on the ground in a perfect circle of 2½ to 3½ inches in diameter. These leaves usually have disappeared by the time the bloom appears, so that the flowers seem to lift their rosy colored heads out of the bare, sandy plain. The bloom is wondrously cheery on a bright sunny morning. The roots are thick, covered with a deep red epidermis, and have a slightly bitter taste. When dried and pounded into a meal they make a very nutritious and acceptable diet, formerly much used by our Indians."

One description, that in the Synoptical Flora, says "with a thick and perpendicular fleshy" root. Other descriptions merely state that they are thick and fleshy, which is better, judging

from specimens collected not far from Reno, which show several fleshy root branches, some of them nearly horizontal.

In Amer. Journ. Pharm. **61**: 5. 1889, Mr. Henry Trimble quotes Dr. V. Havard as follows: "The natives use the roots as an article of food. These roots, 3 or 4, or more, curled and twisted, spread out laterally and are generally superficial. As they spring from the caudex they are rarely half an inch in diameter and are seldom thicker than a goose quill; they taper gradually to a length of two to four inches when they branch off into small radicles. The bark is brownish externally, bright red within and very bitter. The inner part of the root is white and farinaceous, containing in the centre the yellowish pith. This white part is quite palatable and said to be very nutritious, a single ounce of the dried article (according to Dr. E. Palmer) being sufficient for a meal. The Indians, generally, boil it with other esculents into a soup." An analysis of the white inner portion of the roots by Mr. Trimble gave the following results:

Fat, resin and wax	4.98
Gum and mucilage	14.80
Albumenoids	3.58
Starch	8.57
Moisture	12.17
Ash	2.53
Woody fibre and undetermined	53.37

The range of the plant is practically the whole of the country west of the rocky mountains, except the moist region immediately adjacent to the Pacific ocean. In the northwest, where it extends into British Columbia, according to Howell in Fl. Northwest Am. 91, it occurs only "on top of the highest hills and mountains east of the Cascade Monntains." But in California it is found on the inner Coast Range from northern Lake to southern Monterey counties. Here the flowers are usually white and the plant has been named *Lewisia alba* by Kellogg, Proc. Cal. Acad. **2**: 115. *f. 36.*

Rydberg, in Mem. N. Y. Bot. Gard. **1**: 140, remarks that the "Bitter-root grows on dry hills among gravel and rocks," and the only noted exception to this habitat is that of Mr. Kelsey's, quoted above—"bare sandy plains." The rocky and stony character of the places frequented by the plant is well shown in our illustration, made from a photograph taken along Alum creek, near Reno, by Professor G. J. Young, of the University of Nevada.

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The Nut Pine (*Pinus monophylla* Torr. & Frem.)

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MUHLENBERGIA

NOTES ON THE FLORA OF THE PECOS RIVER NATIONAL FOREST

By Paul C. Standley

The Pecos River National Forest is located in the central-northern part of the territory of New Mexico, in San Miguel, Taos, Mora, Rio Arriba, and Santa Fe counties. Its area is about 670 square miles. The Pecos river, which flows through eastern New Mexico and western Texas into the Rio Grande, has its source in this area on the side of one of the Truchas Peaks, hence the name of the forest.

The region is one mass of mountains, the mass being separated by the Rio Pecos into two ranges, the Santa Fe Range on the west and the Las Vegas Range on the east. Here are found the highest mountains in the territory, thirty-two of the peaks attaining elevations of 10000 feet or more. The peaks upon which collections were made by the writer, and their elevations are: Truchas Peaks, 13306, 13275, and 13150 feet, Pecos Baldy, 12500 feet; Elk Mountain, 11500 feet; Round Mountain, 11000 feet; and Grass Mountain, 10000 feet. The highest peaks have snow upon them almost or quite throughout the year, and snow remains on many of the lower ones until late in the summer.

Only a small amount of collecting has been done in the forest in the past, and practically nothing has been published concerning its flora. Professor F. H. Snow, of Kansas University, spent parts of several summers in the early eighties on the eastern side of the region, especially at and near Harvey's ranch and the Las Vegas Hot Springs; his plants are almost all in the herbarium of Kansas University, and nothing has ever been published about them. During the summer of 1898 Messrs. Maltby

and Coghill, of the University of New Mexico, collected two or three hundred numbers in the vicinity of Winsor's ranch. A set of these plants is in the herbarium of the Agricultural College. Dr. Vernon Bailey, of the U. S. Biological Survey, collected during one summer in the forest, but the writer has seen nothing published concerning his collections. Professor and Mrs. T. D. A. Cockerell spent parts of several summers there, and in August of 1902 ascended Truchas Peak. In the American Naturalist for that year is an account of their trip and a short list of plants collected above timber line on this peak. Mrs. W. H. Bartlett, of Santa Fe, who has been an enthusiastic student of the New Mexican flora, has forwarded several collections made along the upper Pecos to our herbarium.

Just to the west of the area lies Santa Fe, where Fendler collected the types of so many New Mexican plants. Here, too, Professor A. A. Heller collected during the early summer of 1897.

The writer spent two months of the summer of 1908 collecting in and near the forest, and as he made only a few sets of plants, he was able to give the greater part of his time to the exploration of the flora rather than to the preparation of specimens. About six weeks were spent at Winsor's ranch on the Rio Pecos about twenty miles up the river from the small village of Pecos. From this ranah numerous trips were made in every direction, the most of them lasting a single day. Pecos Baldy was visited early in July; a trip of three days' duration was made to the Truchas Peaks during the first week of August. Visits were also made to Santa Fe about thirty miles distant by trail across the Santa Fe Range, crossing the heads of the Rio Nambe and the Rio Tesuque on the way, and to Harvey's upper ranch on the east side of the forest. Most of the plants were collected about Winsor's, and it is a remarkable fact that almost all the plants collected below timber line could be found within a mile of the ranch. Two weeks were spent at Harrison's ranch near the town of Pecos, in a region of low, sandy, and stony hills, which were covered with a scanty growth of pinyon and juniper. Altogether about 1325 numbers were secured, representing prob-

ably 800 species, besides about 100 numbers of fungi.

The flora of the forest is, as might be expected because of its geographical position, very much like that of Colorado, and most of the plants found are listed in Rydberg's Flora of that state. A considerable number of the plants collected by Fendler about Santa Fe were recollected, some of them at their type stations along Santa Fe creek.

Winsor's ranch has an altitude of about 8000 feet. It is situated within a stone's throw of the Pecos at the mouth of a small stream known as Winsor creek. Numerous other streams empty into the Pecos both above and below the ranch; in fact, one can hardly go a mile in any direction without crossing one of the mountain brooks. On all sides of the ranch rise the steep sides of the lower mountains, covered with a rather thick growth of *Pinus scopulorum*, *Pseudotsuga mucronata*, *Abies concolor*, *Picea Parryana*, and *Populus tremuloides*. Underneath these trees such shrubs as *Lepargyraea canadensis*, *Edwinia americana*, *Prunus melanocarpa*, several roses, *Juniperus sibirica*, several species of *Ribes*, *Opulaster monogynus*, and *Sambucus microbotrys* are of frequent occurrence. In places where there are but few large trees upon the mountain side, there is a thick growth of some of the low, bushy oaks of the *Gambelii* group. Growing underneath and among these trees and shrubs were found many interesting herbaceous plants. On one hillside with northern exposure along Winsor creek were found three species of *Pyrola*, two of *Peramium*, several of *Limnorchis*, a *Corallorhiza*, masses of a beautiful *Cypripedium*, and several other orchidaceous plants, besides *Arctostaphylos Uva-ursi*, *Hypopitys Hypopitys* in abundance, a *Vaccinium*, and many others equally interesting because of their rarity in arid regions.

Along the streams the most conspicuous shrubs were *Distegia involucrata*, *Dasiophora fruticosa*, *Alnus tenuifolia*, *Salix Bebbiana*, and *Acer glabrum*. *Populus angustifolia* extended up the Pecos to the mouth of the Rio Mora about two miles from Winsor's. The great white umbels of *Heracleum lanatum* and the stiff stalks of *Veratrum tenuipetalum* were equally conspicuous along the edges of some of the streams. The valleys

are in most places very narrow, cliffs frequently rising abruptly on both sides of the streams and forming "boxes." Now and then, however, narrow meadows are found where grasses, sedges, and other meadow plants abound. These fields, wherever they were found, were gay with the yellow of the *Dugaldea* and the purples and whites of the Erigerons.

Several ferns were found in the neighborhood of the ranch, notably *Athyrium filix-foemina* (only one clump of this was seen), *Filix fragilis*, *Cheilanthes Fendleri* and *C. Feei*, and *Woodsia mexicana*. In places there were great fields of the bracken. Only one representative was seen of that family so abundant elsewhere in the Territory, the Cactaceae. About a mile below Winsor's one or two plants of *Echinocereus coccineus* were found. On the western side towards Santa Fe several species of *Opuntia*, *O. arborescens* as well as some of the Platopuntiae, were abundant, but only after the boundary of the forest had been passed.

At elevations only slightly above Winsor's most of the pine timber disappears, and almost the only tree found besides the aspens is the spruce. This forms dense forests in which hardly any other vegetation occurs. Almost the only herbaceous plants found here are *Vaccinium oreophilum*, *Oryzopsis asperifolia*, and *Pedicularis racemosa*. Several lichens are very abundant upon the dead limbs of the trees, hanging down from them one and two feet. In this zone are a great many areas that have been burned over in years past. For miles in places the ground is covered with logs so that it is impassable except where the rangers have opened trails. Most of the fallen logs seemed to be in good condition; the bark was gone from them but the wood was frequently perfectly sound. One of the oldest settlers was questioned concerning the time of the occurrence of the fires which threw down so much of the timber. He said that it had been before he came to the country. One of the forest rangers informed the writer that the Indians state that the fires occurred forty and fifty years ago. It is almost incredible that fallen timber should endure for so long a time at altitudes of nine and ten thousand feet where the rainfall is comparatively heavy.

Among this fallen timber the aspens are beginning to grow, but it does not appear probable that the areas will ever again be covered with coniferous timber unless systematically replanted by those in control of the forest.

Numerous small lakes occur in the region. There is one of some size on the side of Pecos Baldy above timber line at an elevation of perhaps 11800 feet. Another one visited was Spirit Lake upon a shoulder of Santa Fe Baldy. The spruces grew up to the very edge of it, and their reflection in the water gave it a dark, uncanny appearance, which, coupled with the almost oppressive silence that prevails in the thick spruce timber, suggests the reason for the application of this name to the little body of water. About the edge of the lake is a bog, similar to the one on Pecos Baldy. Several of the water grasses were abundant in it, mixed with numerous sedges and rushes. The elk-slip, *Caltha leptosepala*, carpeted the ground here and there, while *Veratrum*, one or two species of *Geranium*, *Rhodiola polygama*, several Senecios, and *Elephantella* formed dense clumps of herbage.

To the northeast of Winsor ranch is Hamilton Mesa, an area about five miles long and a mile wide in places. Its sides are steep and forest covered, its top, which is about 10000 feet above sea level, is a great, grassy, treeless meadow. Near by are Round Mountain and Grass Mountain of similar appearance but less extensive. Here many herbaceous plants seem to reach their fullest development, and here are found the best grazing lands in the forest. *Festuca arizonica* and one or two other members of this genus, several Poas, one or two Danthonias, and *Koeleria cristata* were the most abundant grasses. Late in the summer these meadows in places were solid sheets of color. Great fields of purple Campanulas, scarlet *Gilia* and *Pentstemon*, white *Leucampyx* and *Thelypodium*, numerous yellow composites, the rose-purple *Aragallus Richardsonii*, and dozens of others equally brilliant, formed a riot of color that not even the brush of a master could paint or the pen of a writer describe. Several miles away, looking from Grass Mountain, one could see a whole mountain side that was ablaze with *Dugaldea*. Higher up on

the sides of Truchas Peak and Pecos Baldy were other flowers equally beautiful if not so gaudy. Acres and acres of blue columbine seemed like patches fallen from the sky itself. Above timber line the colors were often even more intense; purple polemoniums, the golden, fur-capped flowers of *Ranunculus Macauleyi*, the star-like heads of the Senecios, rose-colored clovers, white-and-blue Calthas, masses of blue Mertensias, the bright spikes of the Elephantella, and many others, furnished as striking combinations of color as the larger and more gaudy but not more beautiful plants of the lower meadows.

Following is a list of those plants collected which appear not to have been reported from the Territory before. A few that have been collected in other parts of the Territory are mentioned because of their special interest. Several of the plants collected seem to be undescribed, and descriptions of them are included here; their types are in the herbarium of the New Mexico Agricultural College. The plants previously enumerated by Mrs. Cockerell are not mentioned in this list. A number of other names assigned to plants of the collection are new to the flora of New Mexico, but the determinations are so uncertain that no mention is made of them. Of the plants collected by Mrs. Bartlett and by Maltby and Coghill in the forest, all except two were collected by the writer. These exceptions are *Oxyria digyna* and *Senecio blitoides* Greene. Probably two-thirds of the plants collected this year were not secured by these earlier collectors.

LIST OF THE MORE INTERESTING PLANTS COLLECTED

4802. SELAGINELLA DENSA Rydb. Truchas Peak; also on rocks just below Winsor's. The only other specimens that we have from the Territory were collected in the Black Range, more than two hundred miles away, by Mr. Metcalf.

4286. PINUS ARISTATA Engelm. On Pecos Baldy above timber line and at its edge. Here the small trees or more properly shrubs, were much distorted by the force of the wind, but on the top of Grass Mountain at 10000 feet, the trees were considerably larger.

4063. JUNIPERUS SIBIRICA Burgsd. A common shrub at about 8000 feet. It was not observed on the west side of the Santa Fe range.

4981. CHLORIS VERTICILLATA Nutt. Growing upon the old ruins near Pecos, in the crevices of rocks; probably introduced.

4834. TRISETUM MAJUS (Vasey) Rydb. Abundant on Truchas Peak, and elsewhere above timber line.

The following Carices were determined by Mr. K. K. Mackenzie. Almost all of them are new to our flora, although most of them are not rare in Colorado.

4162. CAREX ALPINA Sw. Truchas Peak.

4059. C. AUREA Nutt. Side of Grass Mountain.

4434. C. BELLA Bailey. Near the head of the Rio Nambe.

4060. C. CAPILLARIS ELONGATA Olney. Side of Grass Mountain.

4335. C. EBENEA Rydb. Pecos Baldy; also on Truchas Peak.

4131. C. FESTIVA Dewey. Along Winsor creek.

4254. C. INTERIOR Bailey. Winsor's ranch.

4839. C. NOVA Bailey. Truchas Peak; also on Pecos Baldy and at Spirit lake.

4108. C. OBTUSATA Lilj. Winsor creek.

4154. C. OCCIDENTALIS Bailey. Below Winsor's ranch.

4337. C. SICCATA Dewey. Pecos Baldy.

4094. C. USTA Bailey? Mouth of Ponchuelo creek.

4393. C. VARIABILIS Bailey? Spirit lake; also along Ponchuelo creek and on Pecos Baldy.

4764. JUNCUS TRIGLUMIS L. Truchas Peak at timber line.

4797. J. DRUMMONDII E. Mey. Truchas Peak and at Spirit lake.

4159. J. BALTICUS MONTANUS Engelm. Along the Pecos below Winsor's ranch; along the Arroyo Pecos near the old Pecos ruins; Harvey's upper ranch.

4272. JUNCOIDES PARVIFLORUM (Ehrh.) Coville. On Pecos Baldy, where, as in many other places in the forest, it is common.

4334. J. SPICATUM (L.) Kuntze. Pecos Baldy; Truchas Peak.

4302. LLOYDIA SEROTINA (L.) Sweet. On Pecos Baldy about the snow banks.

4200. STREPTOPUS AMPLEXIFOLIUS (L.) DC. Only one clump of plants was seen, growing along Winsor creek at the edge of the water.

4082. CYPRIPEDIUM VEGANUM Cockerell. Abundant on hillsides along Winsor creek. In places it formed patches of several square rods.

4887. OPHRYS NEPHROPHYLLA Rydb. Seen only in Horsethief canyon, where it was rather abundant.

4861. EPIPACTIS DECIPIENS (Hook.) Ames. Hillsides along Winsor creek, also at Harvey's upper ranch.

4353. EPIPACTIS OPHIOIDES (Fernald) House. With the above, but more common.

4208. CORALLORHIZA MULTIFLORA Nutt. Abundant in the deeper woods.

COELOGLOSSUM BRACTEATUM (Willd.) Parl. At Winsor's ranch; very rare.

4661. RUMEX ACETOSELLA L. Of rather plentiful occurrence at Harvey's ranch; also noticed in quantity at the mouth of Willow creek. Mrs. Bartlett collected it at the Las Vegas Planting Station in the southeastern part of the forest.

4813. BISTORTA VIVIPARA (L.) S. F. Gray. Truchas Peak; also at Winsor's ranch (4120). The specimens of the latter collection have considerably narrower and more acute leaves, but otherwise do not seem separable from the Truchas Peak plant.

4455. CHENOPODIUM BOTRYS L. On the upper Rio Tesuque, growing at some distance from any habitation.

5149. AMARANTHUS VISCIDULUS Greene. Very plentiful on the dry hills about Pecos. Its erect habit distinguished it at

once from *A. blitoides*. It has been collected before only at the type station at Gilmore's ranch in the White mountains.

4092. CRUNOCALLIS CHAMISSONIS (Esch.) Rydb. Mouth of Ponchuelo creek.

4163. MOEHRINGIA LATERIFLORA (L.) Fenzl. Along the Pecos below Winsor's ranch.

4331. SILENE ACAULIS L. Of infrequent occurrence on Pecos Baldy.

4383. CALTHA LEPTOSEPALA DC. Spirit lake; also on Pecos Baldy and in bogs elsewhere.

4124. ACTAEA VIRIDIFLORA Greene. In flower July 2; in fruit July 28 (4573). This plant had bright red fruit. Under no. 4627 was distributed a collection under another specific name, a plant which probably belongs to this species. The latter plant, with white fruit, was collected at Harvey's ranch growing along with the red fruited form, and is probably a variant of it.

4800. RANUNCULUS MACAULEYI A. Gray. This most beautiful plant covered large patches of ground on Truchas Peak and on Pecos Baldy, growing up to the very edges of the snow banks.

4324. THALICTRUM ALPINUM L. Of rather sparing occurrence on Pecos Baldy.

4203. TRAUTVETTERIA GRANDIS Nutt. In a swamp at the forks of Winsor creek; also on Pecos Baldy at timber line. It is not reported from Colorado in Rydberg's Flora. It occurs in southwestern New Mexico in the Mogollon mountains.

4315. MICRANTHES RHOMBOIDEA (Greene) Small. Abundant on Pecos Baldy and Truchas Peak. A few plants were collected about a mile below Winsor's at an altitnde of about 7800 feet. These had, no doubt, been brought down from above timber line by the river. The species has never been collected elsewhere in the Territory, so far as I can learn.

4768. PARNASSIA FIMBRIATA Banks. Truchas Peak in a bog just at timber line. The plants are rather smaller throughout than most specimens of the species, but otherwise do not seem remarkable.

4742. P. PARVIFLORA DC. Seen only at the edge of a small pool along the river near Winsor's.

4799. SIBBALDIA PROCUMBENS L. Common on Truchas Peak, Pecos Baldy, and near the head of the Nambe.

4446. SORBUS SCOPULINA Greene. Between the Rio Tesuque and the Rio Nambe on the trail between Winsor's and Santa Fe. Collected by Heller in 1897 and distributed under the name of *S. sambucifolia* (Roem.) C. & S. It was not seen in the central and western parts of the forest.

4974 and 4975. LUPINUS KINGII S. Wats. In an arroyo near Pecos. Both forms of the plant, the one with white and the other with bluish-purple flowers, were found growing together.

5012. TRIFOLIUM HYBRIDUM L. Noticed in several fields about Pecos, probably introduced in alfalfa seed.

5001. MEDICAGO LUPULINA L. On the sandy banks of the river at Pecos; also collected along Santa Fe creek at Santa Fe, where it was found by Heller.

5021 HOMALOBUS MACROCARPUS (A. Gray) Rydb. A few plants that had finished fruiting were collected near Pecos.

5087. ASTRAGALUS OREOPHILUS Rydb. Dry hills about Pecos.

4377. ARAGALLUS RICHARDSONII (Hook.) Greene. Common at the south end of Grass Mountain, at an elevation of about 10000 feet.

4285. VIOLA RETROSCABRA Greene. Pecos Baldy.

4033. LEPARGYRAEA CANADENSIS (L.) Greene. Common on shaded hillsides along Winsor creek and elsewhere. It seems not to occur on the western side of the forest, which probably accounts for the fact that it has not been reported from New Mexico before.

4318. OREOXIS HUMILIS Raf. Pecos Baldy.

4886. MONESES UNIFLORA (L.) A. Gray. Rather abundant in the thick spruce forest in Horse-thief canyon. Three or four plants were collected on the side of Truchas Peak just below timber line.

4230. PYROLA ASARIFOLIA Michx. Abundant on a shaded hillside along Winsor creek.

4227. P. CHLORANTHA Sw. Same locality.

4229. P. SECUNDA L. Same locality.

4685. P. PICTA Smith. Near Harvey's ranch, where it was collected on a hillside along with the three other species mentioned. This species has also been found in the Mogollon mountains.

4210. VACCINIUM OREOPHILUM Rydb. In thick spruce timber above the forks of Winsor creek; at Harvey's ranch. The fruit has an excellent flavor, and Mr. Harvey reports that the berries, which he sometimes gathers, are fully as good for cooking as the eastern huckleberries.

4270. PRIMULA ANGUSTIFOLIA Torr. Pecos Baldy. Nearby was found *P. Parryi* A. Gray, which occurred besides on Truchas Peak at and just above timber line.

5011. AMARELLA STRICTIFLORA (Rydb.) Greene. Common in meadows about Pecos.

4014. CHONDROPHYLLA FREMONTII (Torr.) A. Nelson. An inconspicuous plant in a meadow along the river at Winsor's.

4773. SWERTIA PALUSTRIS A. Nelson. In a bog on Truchas Peak just below timber line; also in Horse-thief canyon.

4298. POLEMONIUM CONFERTUM A. Gray. A beautiful flower, abundant on Pecos Baldy.

4385. P. SCOPULINUM Greene. Spirit Lake. Common at the higher elevations, usually in the damper and more shaded places.

4982. **Androcera heterodoxa** (Dunal)

Solanum heterodoxum Dunal, Hist. Solan. 235. *pl.* 27. 1816.

Dry hills about the old Pecos ruins.

5081. VERBASCUM THAPSUS L. Sparingly introduced at Pecos. The writer collected the plant during the summer of 1907 along Ruidoso creek in the White mountains.

4275. BESSEYA ALPINA (A. Gray) Rydb. On Pecos Baldy along with *B. plantaginea.*

4096. VERONICA SERPYLLIFOLIA L. Winsor's ranch.

4278. ELEPHANTELLA GROENLANDICA (Retz) Rydb. In a bog on Pecos Baldy; common at the higher elevations elsewhere in the forest.

4789. PEDICULARIS PARRYI A. Gray. Truchas Peak.

4204. PEDICULARIS RACEMOSA Dougl. In the thick spruce timber near Spirit Lake; also on Truchas Peak below timber line.

4329. PLANTAGO TWEEDYI A. Gray. Pecos Baldy.

4883. LINNAEA AMERICANA Forbes. In the thick spruce forest in Horse-thief canyon.

4047. CAMPANULA PARRYI A. Gray. Of rather common occurrence at Winsor's in meadows.

4182. VALERIANA ACUTILOBA Rydb. Along Ponchuelo creek; Truchas Peak at timber line.

5150. XANTHIUM SPINOSUM L. Occurring about several barnyards near Pecos. This, one of the most offensive of weeds, seems to be well established and will probably spread rapidly unless some measures are taken to exterminate it. It has been reported from one or two other places in the Territory.

4859. GAERTNERIA TOMENTOSA (Nutt.) Heller. Observed only at Winsor's ranch in the dooryard, where it is driving out the blue-grass.

4807. TONESTUS PYGMAEUS (T. & G.) A. Nelson. Only a few very small plants were collected on Truchas Peak.

ASTER NOVAE-ANGLIAE L. On sand bars along the river at Pecos.

4997. MACHAERANTHERA VARIANS Greene. Near Pecos.

4820. ERIGERON PINNATISECTUS A. Nelson. Truchas Peak.

4829. E. MELANOCEPHALUS A. Nelson. With the above.

4575. E. SUPERBUS Greene. Common on shaded hillsides along Winsor creek and in several other localities.

Erigeron pecosensis sp. nov.

Perennial from a slender rootstock: stems erect, mostly about 25 cm. high, rather stout, striate, soft pubescent throughout or becoming glabrate below, not glandular: radical leaves spatulate, obtuse, tapering to a short, winged petiole, bright green, glabrous, except the usually ciliate margins, the blades about 30 mm. long and 12 mm. wide; stem leaves lanceolate or oblong, obtuse and mucronate or acute above, sessile by clasping bases, glabrous, except the long-ciliate margins; the upper stem leaves not much reduced, but the stems not appearing very leafy: heads 1 to 7 on short peduncles, the disk about 13 mm. wide and 7 mm. high, the purple rays very narrow and very numerous, extending about 1 cm. beyond the disk: bracts in two series of equal length, linear, with acute or acuminate tips, appressed or the tips slightly spreading, glandular puberulent and usually with rather abundant villous hairs.

The plant strongly suggesis *E. macranthus*, but its smaller size, more pubescent stems, usually less acute leaves, and more or less villous bracts distinguish it. Type collected in a wet meadow along the Pecos river near Winsor's ranch, July 16, 1908, Standley 4358; altitude about 8200 feet.

A very handsome species, growing everywhere along the streams in this region. The same plant was also collected along Ponchuelo creek near the forks, July 4, 1908, Standley 4181. The latter collection was from a drier place, made before the rains had begun, circumstances which help to explain the minor differences between the plants of the two numbers.

No. 4830, collected on Truchas Peak above timber line, August 8, 1908, at an altitude of over 12000 feet, seems to be a low, subalpine form of this. It is only about 1 dm. high, and there is only a single head on each stem; the rays, too, are of a deeper purple, otherwise there does not seem to be much difference between this and the type.

5041. HELIANTHUS ARIDUS Rydb. Near Pecos, growing with *H. lenticularis*, but readily distinguished beeause of its narrower, shining leaves. A few plants were seen at Winsor's.

RATIBIDA TAGETES **cinerea** var. nov.

From the typical form this plant differs in being cinereous almost throughout: the stems and lower surface of the leaves are covered with a usually dense pubescence composed of rather coarse, appressed, and straight, or sometimes somewhat matted, pointed hairs; the upper surface of the leaves is green, and with much less abundant pubescence: the divisions of the leaves seem to be rather wider than in the species.

Type collected at Harrison's ranch near Pecos, New Mexico, August 21, 1908, Standley 5156, growing on a dry hillside at an altitude of about 6700 feet. The plant was associated with the species but was readily distinguishable, the collector thinking at first that it was the typical form of the plant affected by some fungus.

4410. COREOPSIS LANCEOLATA L. Distributed under this name rather reluctantly, because it seems to differ in several particulars from the eastern form of the species. The material in our herbarium is insufficient for satisfactory comparison of the plant, which should, from its geographical location, be distinct. It was collected on a mountain side near the Pecos river, growing under pine trees. The specimens have considerable pubescence on the lower part of the stems, and the upper leaves are all 3-parted and distinctly petioled. The leaves seem to be relatively wider than those of eastern specimens of *C. lanceolata* that we have seen. The plant reproduces by stolons, a method of propagation which explains the fact that the stems occurred singly. The plant was not at all abundant in the one locality where it was collected, but attracted notice at once on account of its large and handsome heads.

4809. ACHILLEA ALPICOLA Rydb. Truchas Peak. Readily distinguished from *A. lanulosa*, which occurred at timber line only a few hundred feet below, by its dwarfed habit and the darker edges of the involucral bracts.

4255. ARNICA CORDIFOLIA Hook. Shaded hillsides along Winsor creek.

5069. TRAGOPOGON PORRIFOLIUS L. Rather common in cultivated fields about Pecos; also along Santa Fe creek at Santa Fe.

New Mexico Agricultural College.

THE NUT PINE

By A. A. Heller

On the 24th day of January, 1844, Captain J. C. Fremont, the "Pathfinder," came upon *Pinus monophylla*, the nut pine, for the first time. It was in western Nevada, not far from the site of the present city of Carson, near the northwestern limits of the species.

On the morning of that day an Indian came to the camp, bringing "with him in a little skin bag a few pounds of the seeds of a pine tree, which to-day we saw for the first time, and which Dr. Torrey has described as a new species, under the name of *pinus monophylla;* in popular language, it might be called the *nut pine.* We purchased them all from him. The nut is oily, of very agreeable flavor, and must be very nutritious, as it constitutes the principal subsistence of the tribes among which we were now travelling."

Having engaged this man to act as a guide to a pass leading across the Sierras, they proceeded upon the journey.

"The road led us up the creek, which here becomes a rather rapid mountain stream, fifty feet wide, between dark-looking hills without snow; but immediately beyond them rose snowy mountains on either side, timbered principally with the nut pine. On the lower grounds, the general height of this tree is twelve to twenty feet, and eight inches the greatest diameter: it is rather branching, and has a peculiar and singular but pleasant odor."

In the Second Biennial Report of the California State Board of Forestry, 88, Mr. J. G. Lemmon writes as follows concerning this tree:

"This curious little Single-leaf Pine has been met with in several places on the eastern and southern slopes of the Sierra. Perhaps its headquarters of greatest development are in the Tehachapi Mountains, where Fremont detected it again in March, 1845, having first discovered it the season before near the site of the present city of Carson, as he was about to find a pass through the Sierra near Lake Tahoe. Fremont noticed this pine with

great care for some three hundred miles along his course on both sides of the Sierra. He noticed its resistance to cold, and recorded the fact that in its highest locality the trees were covered four feet with snow, and the mercury stood at −2 degrees. Fremont called it 'one-leafed pine;' Endlicher changed it in honor of the discoverer to *P. Fremontiana*, and the tree has ever since bore both of these names interchangeably; but the better name is *P. monophylla*, since it is the only single-leaf pine known.

"The trees in open situations, as upon the low hills near Carson, Nevada, become round headed, freely branching from the base; but in the gulches of the Sierra they are spire-shaped, or even tall and slim. Trees in the Tehachapi Mountains were noted in June last four feet in diameter and nearly one hundred feet high.

"But the trees of the Sierra are generally decrepit and much broken by winter storms. In sheltered situations beautiful trees are seen of pyramidal outline, often heavily fruited, so heavy that their limbs are bowed to the ground. The cones are usually quickly deciduous. A fine forest of single-leaf pine is found on the San Bernardino Mountains near Bear Valley, of the same character and condition of bearing as in Tehachapi. Male flowers, June fifteenth, were just disseminating their pollen. Formerly the nuts of this pine were collected in great quantities annually by the Washoe tribe of Indians, for food.

"At the harvest time, nearly the whole tribe, men, women, and children, with their ponies, would proceed to the groves of trees and camp by them. With long poles the cones were beaten off by the men, the boys climbing such trees as admitted of it, to secure the fruit, which was taken by the squaws, piled in heaps with leaves and earth thrown over them, and then set on fire.

"When roasted several hours the cones will be found opening and discharging the large and truly delicious kernels.

"There has been much discussion ever since the discovery of this tree upon the character of its leaf, and eminent authorities have held opposing views; some declaring that the leaves were truly single and solitary, others that the terete foliage was due to the firm agglutination of a pair of leaves.

"Sir Joseph Hooker adopted the connate theory, and says:

" 'The anomaly of the single-leaf is due to the cohesion of the two semi-terete leaves of each sheath, and is far from being a constant character. In the plants at Kew the two leaves are as often free as united, and on making a transverse section it will be seen that the vascular bundle in the center of the cylinder is, in fact, double, and that the two parts are sometimes separate.'

"Maxwell F. Masters, editor of the 'Gardner's Chronicle,' London, in 'Annals of Botany,' Vol. II, No. 5 (kindly loaned me by Professor Greene), discusses the phenomenon very plainly, and, as he arrives at a different conclusion from the above eminent authority, it will be of interest to present his statements briefly in this paper. After stating that 'the axial or ramial nature of the typical pine needle is now pretty generally discredited;' he writes:

" 'In the hope of reconciling the discrepancies between these statements, or of ascertaining which is the nearest to truth, I have recently repeated some observations first made in 1883, both as to the minute anatomy of the leaves and to their mode of reproduction.' Then follows a detailed description of the microscopic organs seen in a cross section of a leaf of the *Pinus monophylla*, showing that the structure is in all respects the same as in the leaves of other pines: 'hence,' he concludes, 'the leaf-like body is a *true leaf* which occurs singly usually, but occasionally in pairs; as must have been the case of the leaves examined by Sir Joseph D. Hooker. There is, of course, no difficulty in understanding the latter condition; the anomaly consists in the single cylindrical leaf, to all appearances occupying the apex of a shoot.

" 'To clear up this anomaly I investigated the development of the constituent parts of the leaf bud at various stages of growth, and, without going into details, I may say that development supplied the clue which neither outward morphology nor internal anatomy sufficed to give. In point of fact, in the earliest stages examined there were always two foliar tubercles, one of which speedily overpassed the other, so that ultimately all traces of the second leaf were obliterated. The monophyllous

shaft of this pine therefore owes its peculiarity to the generally arrested development of one of its two original leaves.' "

Engelmann, in the Botany of the Wheeler Survey, 259, describes it as "a small tree, of scraggy growth, with gray bark and stout, mostly single, terete leaves (rarely in pairs, and then semicylindrical and entire on the margins)."

"That single leaf, before its nature was properly understood, troubled botanists a good deal, so that Endlicher, supposing that the single leaf consisted of two agglutinated ones, went so far as to change the name into *P. Fremontii.* They are really single leaves, and the only iustance of such leaves in the genus (I do not speak of the primary leaves of seedlings or young shoots, but only of the secondary leaves, which grow in bundles on what we must take for reduced branchlets)."

In Bot. Cal. **2:** 124, Engelmann says: "It was long considered probable that the terete leaf was in reality a connate pair, but the structure shows a single bundle of vessels and therefore a single leaf. The ducts, always peripheral, vary greatly in number, from 2 or 3 to 12 or 14."

In the Botany of the King Report Watson describes it as a "low tree of rather open rigid habit, the branches spreading or subdeflexed," and says it occurs "on the eastern slope of the Sierra and eastward, and reported from the Cascade Mountains, Oregon. Frequent on many of the ranges of Nevada from the Sierras to the East Humboldt Mountains, at 4,500-7,000 feet altitude, growing 10-20 feet high, rarely 1 foot in diameter. For the first 2-3 years from the seed, the leaves are very short and lance-linear, subflattened, carinate and caniculate, sheathless."

Sargent gives the following description of this tree in his Manual of the Trees of North America, 12:

"A tree, usually 15 to 20 feet, occasionally 40 to 50 feet high, with a short trunk rarely more than a foot in diameter and often divided near the ground into several spreading stems, short thick branches forming while the tree is young a broad rather compact pyramid, and in old age often pendulous and forming a low round-topped often picturesque head, and stout light orange-colored ultimately dark brown branchlets. Bark of the trunk

about ¾ inch thick and divided by deep irregular fissures into narrow connected flat ridges broken on the surface into thin closely appressed light or dark brown scales tinged with red or orange color. Wood light, soft, weak and brittle; largely used for fuel, and charcoal used in smelting. The seeds supply an important article of food to the Indians of Nevada and California.

"Distribution. Dry gravelly slopes and mesas from the western base of the Wasatch Mountains of Utah, westward over the mountain ranges of Nevada to the eastern slopes of the southern Sierra Nevada, and to their western slope at the headwaters of King's River, and southward to northern Arizona and to the mountains of southern and Lower California; often forming extensive open forests at elevations between 5000 and 7000 feet."

This species is practically a tree of the Great Basin, but passes considerably beyond this area in its westerly extension into the Tehachapi mountains in southern California.

There are three other nut pines, *P. edulis*, with leaves two or three to the cluster, common on the eastern slopes of the Rocky mountains from Colorado south, also in southwestern Wyoming, eastern Utah, and extending into northern and central Arizona and to the mountains of northern Mexico; *P. cembroides*, with leaves two or three to the cluster, ranging from central and southern Arizona into northern Mexico and Lower California, usually found at higher elevations than *P. edulis*, and *P. quadrifolia*, with leaves usually four to the cluster, found principally in northern Lower California, but extending into Riverside county, California, along the western edge of the Colorado desert.

These four species fall into the genus *Caryopitis*, recently established by Small, in Fl. Southeast. U. S. 29. The distinguishing characters are leaves with one instead of two fibro-vascular bundles, and seeds with narrow or rudimentary wings which separate and remain attached to the scale when the seed falls.

Pinus monophylla Torr. & Frem. was described and figured in Fremont's Report, 319. 1845.

The photograph which furnished our cover illustration was taken by Professor P. B. Kennedy, at Steamboat Springs, eleven miles south of Reno, Nevada.

A NEW CONIOSELINUM

By George E. Osterhout

Since my article "The Colorado Conioselinum" was published in Muhlenbergia **4**: 108. 1909, I have discovered that I made a mistake in assigning this *Conioselinum* to *C. scopulorum* (Gray) C. & R. I have since received some material which in every way answers the description of *C. scopulorum*, and for the *Conioselinum* of northern Colorado, of which I was writing, a description is therefore proposed.

Conioselinum coloradense sp. nov.

Stem 5 to 6 dm. high from a perennial root, often glaucous, and for the most part carrying three leaves whose ample bases sheath the stem, the umbel or umbels rising from the sheath of the upper leaf: the lower leaves usually biternate and the upper ternate, then pinnate, the segments of the leaflets narrowly ovate or oblong, laciniately lobed and pointed: the umbel rather small with involucre of few scarious bracts, and involucels of similar smaller bracts: the rays usually 10 or 12, slightly scabrous, 2 or 3 cm. long, the pedicels 5 to 8 mm. long: florets white: fruit narrowly ovate, 5 to 6 mm. long, the dorsal ribs rather close together and narrower than the lateral wings: oil tubes 2 to 5 in the intervals and 6 to 8 on the commissure.

From this description it will be seen that *Conioselinum coloradense* is quite different from *C. scopulorum*. In appearance I suppose it closely resembles *Ligusticum simulans* C. & R. The type locality of *C. scopulorum* is in New Mexico, and it may be confined to territory south of northern Colorado. *C. coloradense* is quite common along streams and in springy places in the mountains of northern Colorado and southern Wyoming. My type specimens were collected at Chamber's Lake, Larimer county, Colorado, September 13, 1907, no. 3659. I have it also from Moraine Park, Larimer county, and C. F. Baker's no. 895 collected at Marshall Pass, August 20, 1901, is this species.

New Windsor, Colorado.

ANNOUNCEMENT

A new edition of the Catalog of North American Plants is in preparation. Thus far 68 pages have been printed, and other parts will follow as fast as possible. In all there will be about 300 pages. Since a considerable time must elapse before the work can be completed, the 68 pages and other parts as soon as issued, will be sent to those who wish to have them in that form, for $1.25, payment to be sent with the order.

When completed the Catalog may be had in neat green cloth binding for $1.50 postpaid. Orders for the cloth bound book may be sent in now, payment to be sent when the book is delivered.

A. A. Heller,
128 East 8th street, Reno, Nevada

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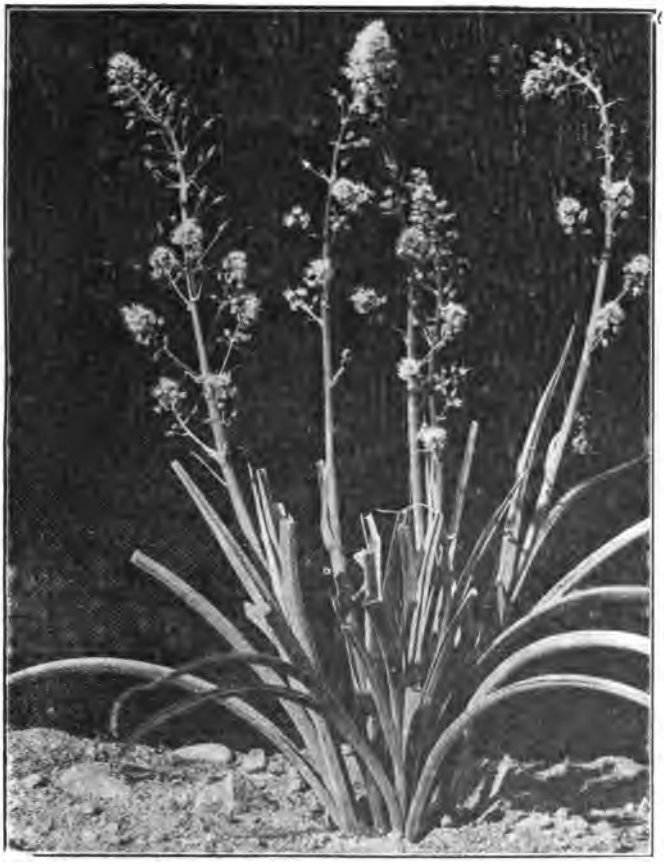

The Death Camas (*Toxicoscordion paniculatum* (Nutt.) Rydb.)

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University of Nevada,
Reno, Nevada

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MUHLENBERGIA

STUDIES IN TRIFOLIUM II.

By P. Beveridge Kennedy

The second group in the Amoria section may be called the stoloniferum group, with the following representatives:

Stoloniferum group

T. stoloniferum	T. virginicum
T. reflexum	T. amphianthum
T. reflexum glabrum	

T. stoloniferum Muhl. Cat. 70. 1813.

The original description of this well-known species is quite meagre, being as follows:

Corolla alb. Perennial. { running buffaloe clover.
Ohio, Kent. Pens. H. fl. Jun.

The first description from which one could really identify the plant is in Torrey and Gray's Flora **1**: 315, although one can get some idea from Eaton's Manual, Ed. 7, 564. 1836. In specimens in the herbaria that I have examined, this species has quite frequently been mistaken for *reflexum*, *hybridum*, *carolinianum* and *repens*. When the stolons are not well developed it resembles very closely *T. reflexum glabrum*. It seems to be more limited in its distribution than *T. reflexum* and its variety *glabrum*. The following account of this species, with a figure, is found in Bull. U. S. Dept. Agric. Div. Agrost. **2**: 49:

A low, smooth perennial, which sends out long runners from the base of the stem. The flowers are white, tinged with purple, in loose heads. The leaflets are broadly obovate and minutely toothed. A native species, growing in open woodlands

and prairies from Ohio west to Kansas, which is greedily eaten by cattle. It should be given a trial in cultivation.

ARKANSAS

Specimens examined.—On railroads, Independence county, *Eggert*, April 23, 1896.

KENTUCKY

Lexington, *Kellerman*, May 10, 1882.

MISSOURI

Centerville, *Bush 561;* Williamsville, Wayne county, *Bush 2685*, *Eggert*, May 16, 1893; Crescent, *Eggert*, May 28, 1886.

NEBRASKA

Bad lands, *Hayden*, July 14, 1853.

OHIO

Cincinnati, *E. James Spence 540; Lloyd*, May 25, 1882, and May 27, 1888; Fern bank, Ohio river, *Short* (no date)

TRIFOLIUM REFLEXUM L. Sp. Pl. 766. 1753.

The earlier descriptions of this species call for a pubescent plant with handsome rose-red and white flowers. While going over the herbarium material at hand, we discovered a large number of specimens that were decidedly glabrous with an instinctive difference in the color of the dried flowers.

It proved to be quite easy to separate the material into two lots. Recourse to the literature indicated that Lojacono in his revision had noticed this difference, and named the smooth one with yellowish flowers *T. reflexum glabrum.* Among the specimens examined was a part of the type material of this variety, collected by Dr. Mead at Augusta, Illinois, in 1842. We took occasion to prepare some slides of the floral parts from this collection, and found that the calyx is glabrous, and the sinuses at the base of the teeth wider, with a slight difference in the shape of the vexillum, wings and keel. By the specimens we were not able to be sure of the color of the flowers, although Lojacono has "floribus pallide ochroleucis fere albescentibus." The majority of the hairy specimens examined show red flowers;

the remainder are too brown or discolored for one to be able to tell their original color.

If on examination in the field the hairy plant proves to have red flowers and the smooth plant yellowish flowers, we believe that there are sufficient other differences in the structure of the flower to give the variety specific rank. The name *glabrum*, however, has been used in this genus for an European species.

In Bull. U. S. Dept. Agric. Div. Agrost. **2**: 48, we find the following concerning *T. reflexum:*

A native annual or biennial species with ascending downy stems, oblong, finely toothed leaflets, and rose-red flowers on short stalks in a round, stalked cluster. The flowers are reflexed and brownish in fruit. Widely disseminated from western New York to Nebraska, Kansas and southward, and especially abundant in the middle prairie region, where it furnishes a considerable amount of palatable and highly nutritious forage, greedily eaten by all kinds of stock. It is a species which should be brought into cultivation.

ALABAMA

Specimens examined—

Lee county: Auburn, *Baker and Earle*, April 17, 1897.

ARKANSAS

Benton county: *Plank.*

Lincoln county: Varner, *Bush 15;* Fulton, *Bush 244;* Prescott, *Bush 248;* Fayetteville, *Harvey 2243.*

FLORIDA

Polk county: *Ohlinger 80.*

GEORGIA

De Kalb county: Stone Mountain, *Eggert*, May 22, 1897; roadsides, Stone Mountain, *Eggert*, May 22, 1897.

Experiment Station, *Rugel 28;* Rome, *Curtiss 6785; Bassler*, June 14, 1879.

KANSAS

Cherokee county: In woods, *Hitchcock*, *649.*

KENTUCKY

Short, 1840.

MISSISSIPPI

Southern Mississippi, *Hilgard*, May, 1869.

MISSOURI

Carter county: Stony hills, *Eggert*, May 17, 1893; Montier, *Bush 75*, *4669;* Webb City, *Bush 1633: Palmer 500.*

Green county: *Weller*, May 18, 1888.

Ripley county: Doniphan, *Bush 280;* Pleasant Grove, *Bush 285.*

Shannon county: *Bush*, June 26, 1888.

St. Louis county: Kirkwood, *Engelmann*, 1886.

Wayne county: Williamsville, *Russell*, May, 1900.

Carterville, *Bush 525;* Herculaneum, *Engelmann*, May, 1835

NORTH CAROLINA

Biltmore, *1310b*, June 2, 1897; *Curtiss 2;* Chapel Hill, *Ashe; Vasey* (no locality or date).

SOUTH CAROLINA

Oconee county: Tomassee, *House 2005.*

TEXAS

Hempstead, *E. Hall 143;* Silver Lake, *Reverchon 1940;* Troup, *Reverchon*, May 8, 1902; Columbia, *Bush 78;* Texas, *Lindheimer 44.*

TRIFOLIUM REFLEXUM GLABRUM Loja. Nuovo Giorn. Bot. Ital. **15:** 150. 1883.

Specimens examined—

ILLINOIS

Madison county: Canteen Lake, *Eggert*, June 5, 1877.

Marion county: *Bebb* (no locality or date).

Augusta, *Mead*, 1842 (type collection); Riverside, *Munroe;* Cabaskia, *A. S. W.*, August 13, 1890.

INDIAN TERRITORY

Limestone Gap, *Butter*, May, 1887; Chelsea, *Bush 1266.*

IOWA

Clinton county: *Butter*, June 20, 1878.

Johnson county: Iowa City, *Hitchcock*, June 1, 1889.

Iowa and Minnesota, *Parry*, 1847 and 1848.

KANSAS

Cherokee county: In woods, *Hitchcock 649*.

Osage county: *Brown*, June 5, 1897.

Republic county: Argeda, *Doran*, 1897.

Shawnee county: Topeka, *Popenoe*, June 12, 1877.

Wilson county: Roper, *Haller*, May 26, 1896.

MISSOURI

Cass county: Gage of Prairie, *C. C. B.*, June 1, 1864.

Illinois county: Horse Shoe Lake, *Eggert*, June 5, 1877.

Jefferson county: Hematite, *Eggert*, May 25, 1896.

St. Louis county: Crescent, *Eggert*, May 28, 1886; St. Louis, *Riehl 166*.

Columbia, *Tracy*, June 11, 1886; Eagle Rock, *Bush 203;* Watson, *Bush 187*.

NEBRASKA

Gage, *Knight 190;* Lincoln: *J. G. Smith*, July, 1890.

WEST VIRGINIA

Banks of the Kanhawa, *Buckley*, June, 1838.

TRIFOLIUM VIRGINICUM Small, Mem. Torr. Club **4**: 112. *pl. 75*. 1894.

[This perennial is unique among the eastern native clovers on account of its narrow leaflets and deep-seated, thick, branching roots. In the characters named it resembles certain far western species, notably *T. harneyense* of Oregon and Nevada. To the best of my knowledge, it has been collected only by myself and Dr. Small, and is known only from the type locality, a dry westerly slope of Kate's Mountain, near White Sulphur Springs, West Virginia. It grows on an open gravelly slope, both trees and shrubs being equally sparse in growth. The plant is dif-

fusely spreading and grows in matted tufts here and there. It is from a region which has produced a number of little-known species, and grows in company with the very rare *Viorna ovata*. —A. A. HELLER.]

Specimens examined—

WEST VIRGINIA

Greenbrier county: Kate's Mountain near White Sulphur Springs, *Small*, May 16, 1892; *Heller 843*.

TRIFOLIUM AMPHIANTHUM T. & G. Fl. N. A. **1**: 316. 1838.

T. Roemerianum Scheele, Linnaea **21**: 460. 1848.

This is an exceedingly interesting clover on account of the stoloniferous branches bearing subterranean flowers at the axils of the leaves in addition to the regular flowers. The subterranean ones are solitary, with a pedicel about 5 mm. long. When young the calyx, vexillum, wings and keel are present. The calyx is more inflated, and has much shorter teeth. The other parts of the flower are not unlike the regular flowers. Development takes place by the vexillum, wings and keel withering, and the inflated calyx surrounding the legume at the base like an involucre. The legume is orbicular and about 3 mm. in diameter, puberulent, with a few pilose hairs. It is apparently four-ovuled; from one to three seeds developing. The seeds are variable in shape, from elliptical-ovoid to reniform, and when fully mature are mottled with purple.

Miss Anna Stockton Pettit in her interesting paper on the peanut (*Arachis Hypogaea* L.), Mem. Torr. Club, **4**: 275. 1895, does not mention this American species of *Trifolium*, but writes about *Trifolium subterraneum* L., an European species with only one kind of flowers, which develop in heads, and after flowering "the peduncle bearing the head sinks to the ground and continuing to lengthen, pushes the head under the soil."

The distribution of *T. amphianthum* seems to be confined mainly to the prairies of Texas.

We would appreciate some fresh seeds, or, still better, a paper from some one living in the region where it grows, who

could watch it daily and give us an account of it from an ecological standpoint.

In Bull. U. S. Dept. Agric. Div. Agrost. **2:** 48. *f. 46*, we find the following concerning this clover: "A low, slender, stoloniferous species occurring in Louisiana and Texas upon the most sterile soils. It spreads rapidly and reseeds itself freely, producing a large amount of early spring pasturage. It comes into blossom about the middle of May. It is one of our most promising native wild clovers for cultivation."

Specimens examined—

LOUISIANA

Prairies on Red River, *Hale*, April.

TEXAS

Columbia, *Bush 91, 473;* Hempstead, *E. Hall*, April 30, 1872; Waco, *Pace 85;* Dallas, *Reverchon 208;* Victoria, *Eggert*, April 10, 1900; near San Felipe on the Brazos, *Lindheimer*, April, 1839.

The third group in the section may be termed the Carolinianum group, consisting of

T. carolinianum	T. saxicola
T. carolinianum villosum	T. bejariense

TRIFOLIUM CAROLINIANUM Michx. Fl. Bor. Am. **2:** 58. 1803.

Michaux's original description represents a very mergre plant. Since that time, however, it has become well known in the Southern States, and is well described in many works. Lojacono has separated a plant collected by Dr. A. P. Garber at Manatee, Florida, as a variety *villosum*. We have examined material from the type collection, and can see nothing but a slight increase in the amount of pubescence. As the plant is extremely variable in this respect, we would not consider the varietal name necessary.

Specimens examined—

ALABAMA

Fort Morgan, *Tracy 7729*.

ARKANSAS

Independence county: *Eggert*, April 23, 1896.

Lincoln county: Varner, *Bush 16.*

Fulton, *Bush 2300;* Prescott, *Bush 246, 544;* prairies, *Engelmann*, June, 1835; dry hills, N. W. Arkansas, *Harvey*, May.

FLORIDA

River Junction, *Curtiss 6377;* southern Florida (Chapman herb.); no locality (Chapm. herb.); no locality (Chapm. herb. 1339, 1491, 1492, 1479, 1499, 1500, 3009, 3291); Manatee, *Garber* (type collection of *T. carolinianum* var. *villosum* Loja).

GEORGIA

Flint River *Rugel 147;* Stone Mountain, *Curtiss 6776.*

KANSAS

Cherokee county: Open ground, *Hitchcock 651.*

LOUISIANA

Madisonville, *Joor*, April 14, 1888.

MISSISSIPPI

Mississippi, *W. and T.* (Bruck Fink herb. in herb. Mo. Bot. Gard.); fields, s. Mississippi, *Hilgard*, May, 1859; Ocean Springs, *Tracy 4854.*

MISSOURI

Webb City, *Bush 1623.*

NORTH CAROLINA

Vasey; Curtiss.

SOUTH CAROLINA

Near Charleston (Bernhardi herbarium).

TEXAS

Brazos county: *Ness 1937.*

Gregg county: Longview, *Eggert*, April 19, 1899.

Harris county: Houston, *Eggert*, April, 1899; *E. Hall 140; Bush 24, 49.*

Mineola, April 24, 1902, Paris, April 10, 1904, Dallas, *209*,

1937, Corsicana, April 25, 1902, *Reverchon;* Galveston Island *Lindheimer*, 1843; Columbia, *Bush 145;* Dallas, *Jones 7525*.

TRIFOLIUM SAXICOLA Small, Bull. Torr. Club **21:** 302. *pl. 212.* 1894.

We have not seen this species, but by the excellent drawing of the plant and all its parts in the above publication, we consider that although related to *carolinianum*, it is abundantly distinct, especially by the leaflets, which have very sharp spine or prickle-like teeth on the margins, and by the long, subulate point to the teeth of the calyx.

It has appeared in none of the collections as yet. Doctor Small collected it at the southern base of Stone Mountain, Georgia, at 1000 feet elevation. We have seen several plants of the true *T. carolinianum* from Stone Mountain. This clover is worthy of investigation to see if it occurs on other mountains at similar elevations in Georgia or other southern states.

TRIFOLIUM BEJARIENSE Moric. (Pl. Nouv. II. *pl. 2.*) Soc. Phys. Geneve **6:** 530. 1833.

T. macrocalyx Hook. Icon. *pl. 285*.

The type locality of this species is in Mexico, but we find it rather common on the prairies of Texas, and extending up to Arkansas. It can readily be recognized by the unequally lobed rather than toothed calyx. The wings also are very characteristic.

Specimens examined—

ARKANSAS

Prescott, *Bush 247*.

TEXAS

Brazos county: College campus, *Booth*, April 14, 1903; on prairies, *Nees*, 1839.

Victoria county: Victoria, *Eggert*, April, 1900.

Houston, *E. Hall 141; Bush 50;* San Felipe on the Brazos, *Lindheimer*, April, 1839; Corsicana, *Reverchon 3754;* Paris, *Reverchon 4295;* Raleigh, *Reverchon*, April 16, 1903; prairies, *Reverchon 1938*.

There are two introduced European species that are considered as belonging to this section, *T. hybridum* and *T. repens.*

TRIFOLIUM HYBRIDUM L. Sp. Pl. 766. 1753.

This is the alsike clover commonly known in cultivation. It is found from Nova Scotia to Georgia, and west to California, and is considered valuable in marshy places and at high altitudes.

The flowers of alsike and white clover are very similar, but the two plants can be readily distinguished by the difference in habit. The stem of alsike clover is erect and ascending, with the peduncles or flowering stems branching out at intervals, while the stem of white clover (*T. repens*) is prostrate or stoloniferous, frequently taking root by this means. The peduncles are extremely long and radical. The white clover or Dutch clover is found in all the northern and northwestern states, where it is valuable for pasture and for lawns. It readily seeds itself by roadsides and other waste places where sufficient moisture can be secured.

NEW OR NOTEWORTHY PLANTS FROM ARIZONA.

BY PAUL C. STANDLEY

The species described or noted below came to the notice of the writer in collections of plants recently sent to our herbarium by Professor J. J. Thornber and by Mr. J. C. Blumer. The type of the new species is in the herbarium of the New Mexico Agricultnral College.

Castilleja Blumeri sp. nov.

Perennial: stems erect, rather slender, simple below but rather densely branched above, rather finely pilose puberulent throughout: leaves yellowish-green, finely puberulent, especially beneath, 30 mm. long or less, lanceolate, acuminate, with a pair of linear, strongly divergent lobes just above the middle, conspicuously triple veined: bracts like the leaves, or one of them entire, green, or a few of the upper ones tinged with red: calyx

22 mm. long or less, cleft about twice as deeply below as above, the two lobes lance-ovate and acutish, each bi-lobed at the apex; upper half of the calyx red, lower half bright green: finely puberulent throughout: corolla about two-thirds as long as the calyx, the galea 12 mm. long or less and 3-toothed at the apex; lower lip of the corolla about 2.5 mm. long, 3-lobed, the lobes linear and obtuse; whole corolla very finely puberulent; flowers on peduncles 1 cm. long or less.

The type was collected by Mr. Blumer (no. 1380) in the Chiracahua mountains, Arizona, at Barfoot Park, on rolling andesitic, pine land, recently lumbered, altitude between 2450 and 2550 meters. It seems not to be very closely related to any other species of Arizona or New Mexico familiar to the writer, or to any whose description he has been able to find. Its distinguishing characteristics are its branching habit, small leaves with divergent lobes, and small calyx and corolla. In spite of its small flowers, the plant is apparently a very handsome one.

Concerning this *Castilleja* Mr. Blumer writes: "This was collected September 15, 1906, at Barfoot Park. Only occasional, on drier situations; flowers brilliant deep crimson or fiery red, passing abruptly into green toward base of the calyx. Division line between this and 1379 does not appear clearly (perhaps because of the large amplitude of variation, especially in 1379). Some calyces are deeply cleft behind, others hardly more so than in 1379. One calyx noted was deeply cleft and each of the divisions 3-lobed. In this species, also, a case of fasciation was found."

CASTILLEJA PATRIOTICA Fernald, Proc. Am. Acad. **40:** 56. 1904.

Here seems to belong no. 1379, collected at the same place and on the same date as the above. It differs from the typical form of the species chiefly in its larger corolla and calyces. The specimen sent to our herbarium was noteworthy because of its densely branched habit, but the collector, after examining a number of specimens, writes that this is not necessarily characteristic of the plant. He also sends the following notes concern-

ing it. "Exceedingly abundant everywhere except on springy soil. Flowers not waning and going to seed, bright red, shading gradually to green toward the base of the calyx. As may be expected in a species so abundant, many variations appear. Some flowers are yellowish, others shade toward crimson. On dry situations it is often only one-fourth as tall as in moister ones, with foliage much more laciniate and purplish. In moist ground one plant was seen that had leaves one-third of an inch broad and sparingly laciniate. In the same place another plant showed coalescence of stems, and the flowers were bunched almost into a head. In some plants the bracts are little or not at all colored, in others showy. The species seems to be in what De Vries calls a plastic state or mutation period. It appears to me now that the luxuriant development and many variations were due simply to a change in the habitat condition brought about by recent logging. In the neighboring virgin forest it was sparingly present and little developed."

Fasciation seems to be not at all uncommon in the Castillejas; the writer noticed several examples this last summer in specimens of *C. confusa*, found in New Mexico in the Pecos River National Forest.

Machaeranthera humilis (A. Gray) comb. nov.

M. tanacetifolia var. *humilis* A. Gray, Pl. Wright. **2**: 74. 1853.

The following names are synonyms according to Dr. Gray in Syn. Fl. **1**: part 2, 206:

M. tanacetifolia var. *pygmaea* A. Gray, Pl. Wright. l. c.

Aster tenacetifolius var. *pygmaeus* A. Gray, Syn. Fl. l. c.

Among the plants forwarded by Professor Thornber was a sheet bearing the label *Machaeranthera tanacetifolia*. The specimens it contained were so different in appearance from representatives of that species which are found abundantly here in New Mexico in our immediate vicinity, that the writer's interest was aroused at once. The only mention made of this plant, apparently, is that by Dr. Gray in Plantae Wrightianae. It is barely possible that the plant under discussion may not be the

same as the one described there under the varietal name of *humilis*, but it at least fits the description very well. Dr. Gray considered his plant a depauperate form, but our Arizona specimens are certainly not depauperate. They differ from *M. tanacetifolia* in their less branched habit, that species branching copiously from the base, less divided leaves, smaller heads, and more foliaceous, broader, and not reflexed bracts. The plants are without doubt specifically distinct from the species to which they were referred.

The type of var. *humilis* was collected near Ojo de Gavilan, New Mexico, by Wright. This is somewhere near the Arizona border, and may even be in that Territory. Var. *pygmaea* was collected on dry, stony hills, valley of the Calado, Chihuahua, and near El Paso, The collection at the former place was made in August and at the latter in April. A description of the plant is as follows:

Annual: stems erect, about 3 dm. high or less, simple below but corymbosely branched above from about the middle, the branches strictly ascending, with a scattered pubescence throughout consisting of short and weak slender hairs: lower leaves 5 cm. long or less, once pinnatifid, the lobes entire and oblong, the terminal one oblong-obovate, sparingly puberulent; upper leaves similar but reduced, the uppermost simple, linear and bract-like: heads rather numerous, hemispherical, 10 mm. high and 12 mm. wide or less: rays numerous, purple: involucral bracts in several series, linear-lanceolate, acute, membranous below and straw-colored, ciliolate and puberulent, the upper half bright green, foliaceous, erect and not reflexed: achenes small and covered with a dense, rather long, silky pubescence: pappus hardly extending beyond the involucral bracts.

Collected at Tucson, Arizona, on the University campus, August 28, 1903, *Thornber 192*.

Herbarium of the New Mexico Agricultural College.

THE DEATH CAMAS

By A. A. Heller

Toxicoscordion paniculatum (Nutt.) Rydb. Bull. Torr. Club **30:** 272. 1903.

Helonias paniculata Nutt. Journ. Phila. Acad. **7:** 57. 1834.

Zygadenus paniculatus Wats. Bot. King Exped. 343. 1871.

In the Bulletin of the Torrey Botanical Club **30:** 272, Dr. Rydberg separates certain of our western plants long called *Zygadenus*, erecting the new genus *Toxicoscordion*, and restricting the name *Zygadenus* to the original *Z. glaberrimus* of Michaux, a plant of the Atlantic side of the continent, found in swamps near the coast from Virginia to Florida.

Toxicoscordion differs from true *Zygadenus* in having bulbs instead of rootstocks, and the sepals and petals with a single gland each instead of two glands.

Toxicoscordion paniculatum is a stout plant, with branched inflorescence. The flowers are creamy-white, the almost clawless petals and sepals rhombic-ovate, "acute," about 4 mm. long and as wide at the base. The flower of a specimen collected near Reno has "acutish" rather than acute divisions. While Watson had the true plant at hand, he evidently also had one or more other species which he confused with it, for he describes the petals as "oblong;" and we know that there are species with oblong petals. He says that in Nevada it is "frequent on the foot-hills of the Virginia, Trinity and West Humboldt Mountains," at from 5000 to 6000 feet elevation.

Rydberg says "it grows on hills up to an altitude of 1500m., ranging from Montana and Washington to New Mexico and California."

While "death camas" does not apply as a name particularly to *Toxicoscordion paniculatum*, it is apparently used more frequently than any other of the names applied to this group of plants. Poison camas, lobelia, squirrel food, wild onion, wild sego, mystery grass, and sand corn, are other names. These names are applied indiscriminately to a number of species, which in turn have all commonly been referred to *Zygadenus* or *Tox-*

icoscordion venenosum (Wats.) Rydb., a rather large flowered plant, the original of which came from wet places in the middle coast region of California. This species probably does not occur outside of California, but Watson mixed one or more other species with it, and confusion as to the identity of the plant has existed from the very beginning. The other known species and their ranges are:

T. intermedium Rydb. the type of the genus, has been found in Idaho, Montana, Wyoming and Utah: *T. gramineum* Rydb. from Saskatchewan to Idaho, Montana, Wyoming and South Dakota; *T. acutum* Rydb. South Dakota; *T. falcatum* Rydb. Colorado; *T. Nuttallii* (Gray) Rydb. Arkansas and Kansas; *T. Fremontii* (Torr.) Rydb. coast region of middle California; *T. arenicola* Heller, Inyo county, California, and probably northward into western Nevada.

J. J. Sullivan, M. D., a member of the Board of Regents of the University of Nevada, while a student at the University, prepared a manuscript on certain poison plants, from which the following is extracted:

"Wild onion (*Zygaaenus paniculatus*) belongs to the lily family, and has received the common names 'wild sego,' 'sand corn," etc. The following description of the plant is from a newspaper bulletin published by Professor Hillman in May, 1893: 'The various species of the genus *Zygadenus* are mainly western in their distribution, and range from the southern to the northern limits of the country, and westward to the Pacific. One particular species seems to have a more limited distribution, being confined to parts of Nevada, California and Utah. The plant is most common in the foothill regions, but sometimes occurs on the wild lands in the vicinity of the hills. Both the hard and rocky and sandy soils seem favorable to the plant's existence. Popularly described, the plant is deep rooted, bearing a coated bulb six or more inches below the surface of the ground. Below the bulb is a blackened stem which has sent forth plants in previous years. This is but a half inch or more in length and diameter, and produces from its crown a few living roots. Along its side numerous dead roots occur. The plant appears

above ground very early, the young leaves increasing in length during March and April. In May a single flower stalk shoots up.

"We have had several cases of poisoning by this plant, a notable one being at the Indian School at Carson City a few years ago. Seven people were poisoned, and the symptoms as given by Dr. Lee, of Carson, were as follows: Nausea, headache, followed by more or less stupor; the heart's action was lessened in frequency, while the strength of the pulse remained normal. The respirations were about normal.

"Last year ('97) Professor Hillman had one of the students in the University collect some of these plants. On his way back after collecting them he stopped at a friend's house (Groton's), where a young man (Bert Holland) ate some of them, mistaking them for onions. He was immediately siezed with violent vomiting, and lost all power of feeling; pinching and sticking with pins not seeming to have any effect.

"A sample of these plants was used by me in my experiments. Fifty grams of both the roots and stems were treated in the same manner as the larkspur (*Delphinium Andersonii*?) previously mentioned by the well-known process of Dragendorff. The chloroform residue of the watery solution on the addition of H_2SO_4 was dissolved yellow, becoming brown red; on the addition of water the solution became violet. HCl dissolves it, and on warming, the solution becomes red, showing the presence of convallamarin, $C_{23}H_{44}O_{12}$. The amyl alcohol residue from the ammoniacal solution on the addition of H_2SO_4 dissolves yellow, then brown-red, and on dilution with water becomes violet. HCl also dissolves it, and it becomes red on warming, showing the presence of convallamarin. The reactions were shown better and came quicker in the extract made from the roots than in that made from the stems."

According to the American Dispensatory, convallamarin is very deadly, "causing death in a few minutes after the introduction of the poison." The various species of *Toxicoscordion* are supposed to be responsible for the death of large numbers of grazing animals. Some species are no doubt more deadly than others.

The photograph which furnished our cover illustration was taken by Professor P. B. Kennedy by the roadside eight miles west of Reno, May, 1902. Part of the plant had been eaten by stock.

ANNOUNCEMENT

A new edition of the Catalog of North American Plants is in preparation. Thus far 68 pages have been printed, and other parts will follow as fast as possible. In all there will be about 300 pages. Since a considerable time must elapse before the work can be completed, the 68 pages and other parts as soon as issued, will be sent to those who wish to have them in that form, for $1.25, payment to be sent with the order.

When completed the Catalog may be had in neat green cloth binding for $1.50 postpaid. Orders for the cloth bound book may be sent in now, payment to be sent when the book is delivered.

A. A. Heller,

128 East 8th street, Reno, Nevada

Volume 5 Number 4

MUHLENBERGIA

APRIL, 1909

Editors: A. A. HELLER and P. BEVERIDGE KENNEDY

The Mountain Mahogany (*Cercocarpus ledifolius* Nutt.)

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University of Nevada,
Reno, Nevada

MUHLENBERGIA

A monthly journal devoted to systematic botany of the higher plants in its broadest sense. Articles on cryptogams (ferns excepted) are not accepted for publication.

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Articles for publication or other communications concerning the journal may be addressed to either of the editors at the University of Nevada, Reno, Nevada.

Subscriptions should be made payable to A. A. Heller, 128 East 8th street, Reno, Nevada.

Volume 1, 1900-1906, consisting of 154 pages, contains 20 titles, with descriptions of many new species and interesting notes about old ones. This volume is of special interest to western botanists. Price $1.00.

Volume 2, not yet completed. The 340 pages issued deal with the explorations of A. A. Heller in California during 1905, 1906, and 1907. The completed volume will contain about 425 pages. Price $4.00.

Volumes 3, 4 and 5 (current), issued as a monthly Price $1.00 each.

Entered as second-class matter November 24, 1908, at the post office at Reno, Nevada, under the Act of Congress of March 3, 1879.

Volume 5 May 12, 1909

MUHLENBERGIA

MR. HELLER'S 1908 CAREX COLLECTION

BY KENNETH K. MACKENZIE

In the year 1908 Mr. Heller collected a number of species of *Carex* in Elko county, Nevada, which he sent me for determination. Most of the specimens represent well-known and widely distributed species, but as several are rare and two apparently represent undescribed species, I here give a list of the species found by him.

CAREX ATHROSTACHYA Olney, Proc. Am. Acad. **7**: 393. 1868.

No. 9020, collected July 17th, at Deeth, in meadows at an elevation of 5340 feet.

CAREX AUREA Nutt. Gen. N. Am. Pl. **2**: 205. 1818.

No. 9317, collected August 5th, on Lamoille creek between Lamoille and the mountains, elevation 6250 feet. Rare here.

CAREX FESTIVA Dewey, Am. Journ. Sci. **29**: 246. 1836.

No. 9372, collected August 8th, on the ridge on the north side of Lamoille canyon at an elevation of 8950 feet. This is probably the most common and characteristic species of *Carex* found in the higher parts of the western portion of the United States.

Carex tissuricola sp. nov.

Clumps apparently medium-sized and with short rootstocks, the culms phyllopodic, 5-8 dm. high, much exceeding the short leaves, roughened on the angles above: leaves with well developed blades six to ten to a fertile culm, the upper two or three very widely separated from one another, the rest clustered at

base, the upper sheath 6-9 cm. long, the blades flat, 3-6 mm. wide, 7-14 cm. long, very short-tapering, roughened at apex: terminal spike staminate or often developing a few perigynia, sessile or short peduncled, 8-15 mm. long, 3-5 mm. wide, the scales oblong-lanceolate, abruptly acute, brown with lighter midrib and hyaline margins; pistillate spikes four or five, the upper two or three sessile or short peduncled, and with staminate spike closely aggregated, the third or fourth somewhat separate and peduncled, and the lowest 9-15 cm. distant, erect, and strongly peduncled, the spikes oblong, 8-20 mm. long, 6-9 mm. wide, rounded or somewhat attenuate at base, containing 15-40 spreading-ascending perigynia in several-many ranks: bracts exceeded by the inflorescence, long sheathed, the lowest resembling the upper stem leaf, the several next reduced, the uppermost becoming scale-like: scales narrowly ovate, acute to cuspidate, narrower and shorter than the perigynia, brown with lighter midrib, the margins narrowly hyaline: perigynia narrowly ovate, much flattened, 5 mm. long, 2 mm. wide or nearly so, obscurely nerved, remotely ciliate-serrulate on the margins above, green and brown mottled, rounded at base, abruptly contracted into a slightly bidentate beak one-fourth to one-third the length of the whole: achenes triangular, obovoid, 1.75 mm. long, 1 mm. wide, about half the width of the perigynia: stigmas three.

No. 9429, collected August 11th, in a canyon at the head of the South Fork of the Humboldt, Elko county, Nevada, elevation 8700 feet. Type in the herbarium of K. K. Mackenzie.

To this species is also to be referred S. Watson's 1255, collected in August, 1869, in Cottonwood canyon, Utah, now in the herbarium of Columbia University.

The present species is closely related to *Carex luzulaefolia* W. Boott, and to *Carex ablata* Bailey, as well as to several other rare and local western species, several of which are but little known. From the above two species it may be distinguished as follows:

Pistillate scales narrowly ovate, acute to cuspidate	C. fissuricola
Pistillate scales ovate-oblong, very obtuse	
Blades of basal leaves widely spreading, 5-8 mm. wide; pistillate spikes oblong-cylindric	C. luzulaefolia
Blades of basal leaves ascending, 3-4 mm. wide; pistillate spikes linear-oblong	C. ablata

A characteristic which readily distinguishes this species from species like *Carex albida* Bailey, *C. herbariorum* Bailey, and *C. pseudo-japonica* C. B Clarke, is its nearly sessile staminate spikes, as compared with the strongly peduncled staminate spike occurring in those species. *Carex luzulina* Bailey, may be separated by its gradually short-beaked perigynia, the beak being less than 0.5 mm. long.

CAREX HETERONEURA W. Boott, Bot. Cal. **2**: 249. 1880.

No. 9368, collected August 8th, on the ridge on the north side of Lamoille canyon, at an elevation of 8950 feet. Apparently this is a rather local species, as it is very sparingly represented in herbaria.

CAREX HOODII Boott; Hook. Fl. Bor. Am. **2**: 211. 1840.

No. 9369, collected August 8th, on the ridge on the north side of Lamoille canyon, elevation 8950 feet. This species stands near *Carex occidentalis* Bailey, and *Carex Hookeriana* Boott, and at times is difficult to distinguish from one or another of these species. The present specimens are noteworthy for the great development of the lowest bract, which is unusual.

CAREX LANUGINOSA Michx. Fl. Bor. Am. **2**: 175. 1803.

No. 9257, collected July 31st, in meadows, William Smiley's ranch near Deeth, elevation 5800 feet. Widely distributed throughout the greater part of the United States.

CAREX MARCIDA Boott; Hook. Fl. Bor. Am. 212. *pl. 212.* 1840.

No. 9258, collected July 31st, in meadows, William Smiley's ranch near Deeth, elevation 5800 feet; also No. 9188, collected July 27th in meadows, Humboldt Wells, elevation 5630 feet. This is an exceedingly variable species, and has a wide distribution in the western half of North America.

Carex microptera sp. nov.

Clumps large, from short stout rootstocks, the culms 5-10 dm. high, aphyllopodic, much exceeding the leaves, strongly striate, smooth on the angles: leaves with well developed blades three to five to a fertile culm, on lower third but not bunched, the upper the larger, the blades flat, 2-3.5 mm. wide, 1-3 dm. long, roughened toward the apex: inflorescence consisting of 5-10 distinguishable but closely branched spikes, forming an ovoid or suborbicular head 12-18 mm. long, 10-16 mm. wide, the spikes ovoid, 5-8 mm. long, 4-6 mm. wide, with a few inconspicuous staminate flowers at base and 15-30 closely packed ascending (but not appressed) perigynia above in several-many ranks, the tips ascending or somewhat spreading: bracts obsolete or scale-like: scales ovate-lanceolate, acute, brown with lighter midrib, the margins scarcely hyaline, slightly narrower and slightly shorter than the perigynia: perigynia lanceolate, 3.5-4 mm. long, 1-1.5 mm. wide, plano-convex, lightly nerved, light brownish or straw-colored at maturity, the body nearly entire, occupied at base by achene, minutely sharp margined, rounded at base, flattened above achene and tapering or abruptly narrowed into the serrulate, bidentate beak one-fourth to one-third the length of the whole: achenes lenticular, 1.25 mm. long, nearly 1 mm. wide, broadly ovoid: stigmas two.

No. 9067, collected July 21st, at William Smiley's ranch near Deeth, Elko county, Nevada, elevation 5800 feet. Type in the herbarium of K. K. Mackenzie.

The following specimens in the herbarium of the New York Botanical Garden are to be referred to this species:

MONTANA: Elk mountains near Blackhawk, *Rydberg 3289* and *Flodman 303*, August 5, 1896; Aldridge, *Mrs. Emma Scheuber*, 1901; Cliff Lake, Madison county, 7500 feet, *Rydberg and Bessy 3796*, July 27, 1897; Manhattan, *Rydberg 2186*, July 17, 1895.

WYOMING: Upper Hoback Basin, 7500 feet, *C. C. Curtis*, August, 1900.

YELLOWSTONE NATIONAL PARK: Mammoth Hot Springs, *Mearns 316*, June 24, 1902.

Like *Carex straminea* Willd. in the eastern states, *Carex festiva* Dewey has had a great number of varying forms referred to it. The present species is proposed to cover a plant which differs from *Carex festiva* in its narrow and short perigynium, which is lanceolate and 4 mm. or less long as compared with the ovate perigynium of *C. festiva*, which is usually about 4.5 mm. long. The spikes also average somewhat smaller than in *C. festiva*, and are not at all separated. As the scales are but little narrower than the perigynia the spikes present a brownish appearance, while in *C. festiva* the scales being much narrower than the perigynia the spikes are much greener in appearance.

CAREX NEBRASCENSIS Dewey, Am. Journ. Sci. II. **18**: 102. 1854.

No. 9211, collected July 28th at William Smiley's ranch near Deeth, elevation 5800 feet; also Nos. 9466 and 9476, collected August 19th in Ruby Valley near Cave Creek Post Office, elevation 6000 feet.

CAREX ROSTRATA Stokes, in With. Arrang. Brit. Pl. ed. 2. 1790.

No. 9272, collected August 4th, at McIntyre's ranch near Fort Halleck, in meadows, elevation 5800 feet. This is a very widely distributed species in the cooler parts of the northern hemisphere. The larger American specimens have of late years been referred to *Carex utriculata* Boott, but the characters on which that species is erected are so trivial and variable that I do not believe it is worth recognizing even as a variety.

The following species were collected in California:

CAREX BOLANDERI Olney, Proc. Am. Acad. **7**: 393. 1868.

No. 8966, collected June 25th in Yosemite Valley near Glacier Point, elevation 4000 feet. This is a well distributed species in the far western part of the United States.

CAREX HASSEI Bailey, Bot. Gaz. **21**: 5. 1896.

No. 9000, collected June 27th, in Little Yosemite Valley, elevation 6100 feet. In the original publication of this species it was said to be related to *Carex laxiflora* Lam. The relation-

ship, however, is undoubtedly with *Carex aurea*, as stated by Mr. Parish in his articles on southern Californian Cyperaceae. Furthermore, it will be very hard, if not impossible, to distinguish this Californian species from the plant of Canada and the northeastern states which has been referred by several authors to *Carex bicolor* All., an European species, the occurrence of which in America is extremely doubtful.

CAREX JONESII Bailey, Mem. Torr. Club **1**: 16. 1889.

No. 9003, collected June 27th, in Little Yosemite Valley, elevation 6100 feet. The type of this species came from Soda Springs, Nevada county, California. It is now known from a considerable number of additional stations, and ranges as far east as Colorado and Wyoming, but it never seems to be a common species.

CYREX MIRABILIS Dewey, Am. Journ. Sci. **30**: 63. 1836

No. 8965, collected June 25, in Yosemite Valley near Glacier point, elevation 4000 feet. This is a common species in the northeastern part of the United States, but its occurrence in California largely extends the range usually given to it.

East Orange, N. J.

STUDIES IN TRIFOLIUM III.

BY P. BEVERIDGE KENNEDY

We have been working for the last four or five years endeavoring to find out the truth in regard to a large section of Pacific coast and Rocky mountain clovers. There are several distinct groups in the section, but the species within the groups are exceedingly variable, and hence it is difficult to differentiate botanical characters that will hold for specific rank. Of the group that we shall term the *longipes* group there are some eighteen published names. A smaller group and one closely related to the above is the *latifolium* group with seven published names. A third we shall term the *eriocephalum* group, in which both the calyx and the foliage are more or less hirsute. This also

has seven published names. The fourth and last in the section is the *macrocephalum* group, recognized by usually having some of its leaves with more than three leaflets, these varying in number from three to nine. In this group there are nine published names. This makes a total of forty-one names that must be considered as species or placed in synonymy. A number of discrepancies that have been handed down in botanical literature should also be corrected.

It has been our aim in these studies to consider that there are no new species of clovers, and to find a place for all specimens submitted to us among those already described. In a recent collection of *Trifolium*, however, sent to us by Mr. Wm. C. Cusick, of Union, Union county, Oregon, a low plant labeled *T. Kingii*, but very different from that species in all respects, came to our notice. Its habit and floral structure readily placed it in the *latifolium* group, of which there are seven members, as follows: *T. Aitonii* Rydb., *T. Covillei* House, *T. Haydeni* Porter, *T. latifolium* (Hook.) Greene, *T. orbiculatum* Kennedy and McDermott, *T. oreganum* Howell, and *T. shastense* House. We have given each of these careful and prolonged study, and have had access to type or type number material of all except *T. Covillei*. The excellent description of the last named, however, in the Botanical Gazette **41**: 1906, precludes any possibility of its being that species, particularly if the illustrations of the vexilli of the two are compared. The calyx of *T. Covillei* is mentioned in the original description as "sparingly hairy above," but the accompanying figure shows it as glabrous.

We desire therefore to propose Mr. Cusick's plant as a new species of *Trifolium* with the following description and accompanying plate showing its structural characters.

Trifolium multipedunculatum n. sp.

A low, somewhat hairy plant with running rootstocks an and occasional long tap root, numerous peduncles and short, thickly matted stems. The flowers are a rich purple, becoming larger, brownish, and reflexed at maturity.

Plant about 1 dm. high, perennial, not involucrate: stems very short and matted: stipules clustered at the base of the stems,

Trifolium multipedunculatum Kennedy

membranaceous, entire, lobes long-acuminate: leaflets hairy beneath, glabrous above, about 10 mm. long and 4 mm. wide, variable in form, lowest ones smaller, obovate and cuneate, upper ones oblong-lanceolate, irregularly and sharply dentate-margined and tapering to a cuspidate apex; petioles hairy, 2-3 cm. long: peduncles 4-6 cm. long, erect, hairy; heads terminal, 2 cm. in diameter when young, becoming larger at maturity: flowers purple, completely reflexed in age by the deflexion of the pedicels, which are 1 mm. long and hairy: calyx tinged with purple, densely pubescent, tube 2 mm. long, teeth 5, unequal and variable, frequently curved at tip, two 4 mm. long, two 3 mm. long, one 1.5 mm. long, 10 nerved, 5 strong main ones running up to the apex of the teeth, and 5 intermediate weak ones: vexillum 14 mm. long and 6 mm. wide, apex rounded and emarginate, with a prominent tip 1 mm. long; blade of wings 6 mm. long and 2 mm. wide, auricled at base, long-acuminate at apex, claw of wings 5 mm long; blade of keel oblong, 4.5 mm. long, 2 mm. wide, with a short abrupt beak: ovary not well developed in our specimens, but sparingly hairy, about 5 mm. long, with a style of the same length.

The type, which is deposited in the Nevada Agricultural Experiment Station herbarium, was collected at the summit of China Cap, Oregon, at 8600 feet altitude in granitic soil. It is Mr. Wm. C. Cusick's no. 3190, bearing the date July 30, 1907. Its nearest ally in habit would be *T. Covillei*, and *T. oreganum* in the character of the flowers.

Explanation of the Plate

1. Wings, about four times natural size.
2. Vexillum, a little more than three and a half times natural size.
3. Keel, about three and a half times natural size.
4. Calyx, slightly more than four times natural size.
5. Flower, natural size.

Nevada Agricultural Experiment Station.

THE MOUNTAIN MAHOGANY

By A. A. Heller

Cercocarpus ledifolius Nutt.; T. & G. Fl. N. A. **1**: 427. 1840.

Nuttall found the original of this species in the "Rocky Mountains, in alpine situations on the summits of the hills of Bear River of Timpanagos, near the celebrated "*Beer Springs*," which abound with carbonic acid." "Beer Spring" is located in southeastern Idaho, probably at what is now called Soda Springs, near Morristown, Bingham county.

Nuttall describes it as "a shrub, or small tree, 6-10 feet high, with white tough wood; the branches gray, terete, covered with circular cicatrizations. Leaves resembling those of Ledum latifolium, very coriaceous, on very short petioles." "The achenium, which with its tortuose and plumose tail almost exactly resembles the fruit of some species of Stipa, is coriaceous and 2-seeded."

In Zoe **2**: 244, Jones remarks as follows concerning this species:

"*C. ledifolius* comes down to an altitude of 7,000 feet in the Wasatch mountains and runs up to over 8,000 feet altitude. It is a densely branched and scrawny shrub on rocky places, and where the moisture is greater and the soil better it straightens up and is 20 feet high and tree-like. In eastern Nevada where the moisture is far less it grows at 8,000 to 9,000 feet altitude, and is generally shrubby. Near the East Humboldt mountains it occasionally comes a little lower toward the edges of the lower foothills, but never in the valleys which are here seldom less than 6,000 feet above the sea. I have seen the trees 40 feet high there; with a trunk 1½ feet in diameter and so well formed as to make good posts. The leaves and flowers do not vary much except at the lowest altitudes."

The photograph which furnished the cover illustration was taken by the writer in the Ruby or East Humboldt mountains on the ridge overlooking Ruby Valley, above Cave Creek Post Office, at an elevation of 9000 feet. Here it is small and

dwarfed, only four to six feet high, since it has to contend with the high winds and snow storms of winter. In the canyons and sheltered places it is frequently a well rounded tree fifteen or twenty feet high with a short trunk a foot in diameter, and several heavy branches almost as thick as the trunk. It is apparently scarce on the Clover mountains, the northern extension of the Ruby Mountains.

Sargent, in the Manual of the Trees of North America, 508, says: "Dry gravelly arid slopes at elevations of 5000-9000 feet above the sea; sometimes on almost perpendicular cliffs and on rocky ridges as a densely branched contorted shrub, with linear revolute leaves, and smaller flowers and fruits (var. *intricatus* M. E. Jones); mountain ranges of the interior region of the United States from western Wyoming to the western slopes of the Rocky Mountains of Montana, the Coeur d'Alene Mountains of Idaho, the Blue Mountains of Washington and Klamath County, Oregon, and southward through the Wasatch Mountains and the ranges of the Great Basin to the eastern slopes of the Sierra Nevada, the northern slopes of the San Bernardino Mountains, California, and to the m untains of northern New Mexico and Arizona; most abundant and of its largest size on the high foothill slopes of the mountain ranges of central Nevada at elevations of 6000-8000 feet."

The genus *Cercocarpus* H. B. K. was established in Nov. Gen. et Sp. **6:** 232. *pl. 559.* 1823, being based upon *C. fothergilloides*, a Mexican species. Up to 1840 this remained the only known member of the genus, when Nuttall published *C. parvifolius*, *C. betuloides*, and *C. ledifolius*. Since that time five other species have been proposed, the latest of which, *C. Traskiae* Eastwood, is found only on Santa Catalina Island, California. *C. parvifolius* is the most widely distributed of all, ranging on the east from Nebraska (type locality "bushy ravines near the sources of the Platte") to western Texas, and on the west from southern Oregon to Lower California. The flowers of all the species are small, yellowish, and in fruit the elongated persistent style is covered with long whitish hairs.

ENGELMANN SPRUCE NEAR THE CALIFORNIA LINE

By Willis L. Jepson

Picea Engelmannii, the Engelmann Spruce, has never been found in California, but one or two localities crowd the California line so closely that the finding of a station within the State is now a possibility. On August 2, 1906, I found this species in Oregon, growing in the canyon bottom of the east fork of Ashland creek between 5000 and 5800 feet, seven miles north of the California-Oregon line. The canyon is a deep one in rough country. The trees ranged from 80 to 160 feet, or possibly 200 feet, in height. A dead tree on the ground was 148 feet high and 3 feet in trunk diameter.

About one year since I received from Miss Laura McDermott, of Virginia City, Nevada, what must be branchlets of Engelmann Spruce. The specimen was collected on the north slope of Mt. Rose, Washoe county, Nevada, at about 9000 feet altitude near timber line, the only tree at greater altitudes being *Pinus albicaulis* in prostrate form. A cone was originally part of the specimen but was lost in transit. In order that the question of its occurrence in the region of western Nevada may be definitely settled, fruiting or at least abundant foliage specimens are very much desired.

Berkeley, California.

[We have visited the region above-mentioned many times, and as yet have only discovered the alpine hemlock or Patton's Spruce (*Tsuga Mertensiana* (Bong.) Carr.) which is not uncommon in groves at 9000 feet elevation. The alpine white pine (*Pinus albicaulis*) is abundant at from 8000 to 9000 feet elevation, where the trunks reach a diameter of three to four feet. At approximate elevations between 9000 and 10000 feet it forms a low prostrate shrub frequently bearing cones. We hope this summer to ascertain with absolute certainty the existence of Engelmann's Spruce on the north side of Mt. Rose.—P. Beveridge Kennedy.]

ANNOUNCEMENT

A new edition of the Catalog of North American Plants is in preparation. Thus far 68 pages have been printed, and other parts will follow as fast as possible. In all there will be about 300 pages. Since a considerable time must elapse before the work can be completed, the 68 pages and other parts as soon as issued, will be sent to those who wish to have them in that form, for $1.25, payment to be sent with the order.

When completed the Catalog may be had in neat green cloth binding for $1.50 postpaid. Orders for the cloth bound book may be sent in now, payment to be sent when the book is delivered.

A. A. Heller,
128 East 8th street, Reno, Nevada

Volume 5 Number 5

MUHLENBERGIA

MAY, 1909

Editors: A. A. HELLER and P. BEVERIDGE KENNEDY

The Wild Phlox (*Phlox Stansburyi* (Torr.) Heller

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University of Nevada,
Reno, Nevada

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MUHLENBERGIA

NOTES ON CONVOLVULACEAE

By Homer Dolliver House

During the course of my investigations upon the North American species of *Ipomoea*, the results of which were published early in 1908, in the Annals of the New York Academy of Sciences, considerable material accumulated relating to other genera of the family, which together with a few corrections in *Ipomoea*, it is the writer's purpose to present here.

Convolvulus

Convolvulus oreophilus sp. nov.

Related to *C. incanus;* stems 5 to 100 cm. long, trailing or prostrate, whitish with a dense fine silky indument, older parts green, finely pubescent or canescent: leaf blades narrowly or broadly ovate, cordate-hastate, obtuse at the apex, 2 to 5 cm. long, the basal auricles spreading, with several obtuse teeth or small lobes, the margin above the base irregularly crenate-toothed; petioles about one-third the length of the blades, silky villous with fine appressed hairs: peduncles exceeding the leaves, 6 to 12 cm. long, 2 to 6-flowered: sepals becoming 8 to 10 mm. long, obtuse or subacute, appressed pubescent, not auricled at the base: corolla white, 2 cm. long, pubescent without on the plicae, the limb angulate: capsules globose, included by the calyx: seeds black, minutely pubescent.

Mexico: Near Tehuacan, Puebla, *Rose; Painter and Rose 9983*, 1905. Type in the National Herbarium.

Convolvulus secundiflorus Fernald

This species, described from Acapulco, Mexico (*Palmer 32*,

1894) also occurs in Colombia, as indicated by collections of Herbert H. Smith, no. 1588, November 19, 1898, made near Santa Marta.

Convolvulus Nashii sp. nov.

Related to *C. repens* of the southeastern United States: stems twining, slender, densely tomentose: leaf blades lanceolate to oblong-lanceolate, 2 to 7 cm. long, acute, cordate-sagittate, the basal auricles 1 cm. long or longer, divergent and standing oblique, the middle lobe of the blade 5 to 15 mm. broad, densely and softly pubescent: petioles 1 to 3 cm. long: peduncles 1-flowered, exceeding the petioles, 2 to 5 cm. long: bracts ovate, obtuse or subacute, 10 to 15 mm. long, including the calyx: corolla white or tinged with pink, 5 to 6 cm. long.

FLORIDA: Eustis, Lake county, *Nash 609*, May 1 to 15, 1894 (type in herb. Columbia University); *Nash 44*, March 12 to 31, 1894; near St. Marks, *Rugel*, 1833 (herb. Columbia University); Cape Canaveral, *Allen B. Burgess 696*, April 2 to 5, 1904 (herb. N. Y. Bot. Gard.).

JACQUEMONTIA

Jacquemontia apiculata sp. nov.

Twining, several meters long: stems, petioles and peduncles densely canescent and tomentose: leaf blades orbicular-ovate, 2 to 5 cm. long and nearly as broad, shallowly cordate or somewhat cordate-sagittate at the base, the sinus only 2 to 6 mm. deep, the apex obtuse or usually rounded and with an abruptly tapering mucronation, 3 to 6 mm. long, greenish and finely pubescent above with minute whitish hairs, silvery pubescent beneath with a dense indument of fine hairs and tomentum; petioles shorter than the blades: peduncles 3 to 8 cm. long, loosely 3 to 11-flowered: pedicels 1 to 2 cm. long: sepals unequal, the outer ones obovate-spatulate, 5 to 6 mm. long, broadest above the middle, obtuse or subacute, tomentose, the inner ones shorter, ovate, acute: corolla violet-purple with white rays, subentire, 20 to 25 mm. broad.

MEXICO: Tamaulipas, near Victoria, 320 m. altitude, *Palmer 117*, February to April, 1907. Type in herb. N. Y. Bot. Garden.

Jacquemontia Nelsoni sp. nov.

Perennial: twining, 1 to 3 m. long, densely and softly pubescent: leaf blades oblong-ovate to ovate-lanceolate, obtuse or rounded at the base, the apex acuminate, 3 to 4 cm. long, minutely but densely rough pubescent above, more softly and more densely pubescent beneath; petioles 6 to 12 mm. long: peduncles elongated, 10 to 15 cm. long, cymosely many flowered: bracts minute, subulate, 1 to 2 mm. long: pedicels 4 to 10 mm. long: sepals subequal, narrowly ovate, tapering to a subacute or obtuse apex, densely ciliate and pubescent with minute brownish hairs: corolla blue, funnel-form, fully 3 cm. long, pubescent without on the plicae, the limb 2.5 cm. broad: capsules globose, 6 mm. in diameter, each of the four valves partially divided, 2-celled: seeds sharply angled on two edges, muricately roughened.

MEXICO: Oaxaca; road between Nopala and Mixistepec, 800-4000 feet altitude, *E. W. Nelson 2442*, March 5, 1895. Type in the National Herbarium.

JACQUEMONTIA CONFUSA Meissn. in Mart. Fl. Bras. **7**: 294. *pl. 106. f. 2.* 1869.

In examining some Mexican specimens of what was supposed to be *Convolvulus nodiflorus*, it was observed that certain specimens possessed subglobose or slightly ovoid and thickened stigmas, instead of the elongated and linear stigmas of typical *C. nodiflorus*. This difference was at first ascribed to the effects of drying, but a more careful examination showed that in certain specimens the difference was constant. The specimens possessing these subglobose stigmas range from Mexico to Brazil, and the shape of the stigma places them in *Jacquemontia* instead of *Convolvulus*. Meissner seems also to have noted this plant and described it under the name indicated above. Aside from the difference in the character of the stigma, already noted, there are scarcely any other appreciable characters to separate *J. confusa* from *C. nodiflorus*.

The north American specimens of *J. confusa* examined are as follows: Zacuapan, *Purpus 2214;* Oaxaca, *Rose 11367*.

THYELLA

Thyella macrocephala (Brandegee)

Jacquemontia macrocephala Brandegee, Zoe **5**: 219. 1905.

MEXICO: Sinaloa; near Cerro Colorado. Type collected by Brandegee.

OPERCULINA

Operculina discoidesperma (J. Donnell Smith)

Ipomoea discoidesperma J. Donnell Smith, Bot. Gaz. **14**: 27. 1889.

Type from Pansamala, Guatemala, altitude 3800 feet.

MEXICO: Chiapas; along road between Teneapa and Yajalon, 3000-5000 feet altitude, *E. W. Nelson 3262*, October 13, 1895 (Nat. Herb.); Guanajuato, *A. Duges*, 1894 (Gray Herb.).

Operculina aurea (Kellogg)

Aneisia aurea Kellogg; Proc. Cal. Acad. **5**: 83. 1873.

Ipomoea aurea Kellogg; Curran, Bull. Cal. Acad. **1**: 143. 1885.

LOWER CALIFORNIA: San Jose del Cabo, *Brandegee 392*, October 17, 1899, September 29, 1890 (Gray herb.); Cape St. Lucas, *Xantus 81*, 1859-60 (Gray herb.).

Operculina lancifolia sp. nov.

Related to *O. rubicunda* House (*Ipomoea alata* Rose, not R. Br.). Stems slender, glabrous: leaf-blades linear-lanceolate, acuminate and cuspidate at the apex, the base cordate-sagittate, 5 to 7 cm. long, 4 to 8 mm. wide, the basal auricles 4 to 7 mm. long, obtuse; petioles 1 to 2 cm. long: peduncles 3 to 4 cm. long, 1-flowered: pedicels 3 to 4 cm. long, slightly thickened: calyx 7 to 10 mm. thick, yellowish or greenish: corolla rose-colored, 5 cm. long, subsalverform, the 5-lobed limb about 3 cm. broad: stamens included.

MEXICO: Chiapas; Valley of Jiquipilas, 2200-2800 feet altitude, *E. W. Nelson 2923*, 1895. Type, sheet *no. 233,546* in the National Herbarium.

Operculina pectinata sp. nov.

Related to *O. ornithopoda* (Robinson) House. Stems rather stout or sometimes slender, glabrous: leaf blades subentire, irregularly pectinately lobed or toothed, the lobes acuminate with toothed margins, subtruncate at the base, the apex acuminate or caudate, 4 to 6 cm. long and as broad; petioles shorter than the blades: peduncles longer than the petioles, 1 to 5-flowered: bracts lanceolate, scarious, deciduous, 4 to 5 mm. long: sepals orbicular-obovate, rounded at the apex, 12 to 14 mm. long, nearly as broad: corolla white, campanulate-funnelform, 3 cm. long or less, 3 to 4 cm. broad, densely pubescent without in bud, less so on the plicae when expanded: capsule as in the related species.

MEXICO: Oaxaca—About Lagunas, *E. W. Nelson 2646*, June 5, 1895 (type in the National Herbarium); San Luis Potosi—Near Tancanhuitz, 1200 feet altitude, *E. W. Nelson 4369*, June 1, 1898 (sheet *no. 330,920* in National Herb.).

The combination *Operculina codonantha* (Benth.), made by the writer (Bull. Torr. Club **33:** 503. 1906), should be credited instead to Hallier f. (Bot. Jahrb. **16:** 550. 1893).

Operculina grandiflora (Jacq.)

Convolvulus grandiflorus Jacq. Hort. Vind. **3:** 39. *pl. 69.* 1776.

Ipomoea latiflora R. & S. Syst. **4:** 240. 1819. (excl. syn. Desr.)

Convolvulus ventricosus Bert.; Colla, Hort. Ripul. 37. 1824.

Ipomoea ventricosa G. Don, Gen. Syst. **4:** 274. 1838.

Calonyction grandiflorum Choisy, Mem. Soc. Phys. Genev. **6:** 442. 1833, as to Jacquin synonymy only.

Operculina ventricosa Peter, in Engler & Prantl, Nat. Pflanzenfam. IV. **3a:** 32. 1891.

Misled by Choisy's mistake in assigning Jacquin's *C. grandiflorus* to *Calonyction*, many authors since, including the writer (Bull. Torr. Club **31:** 591. 1904), have associated this plate of Jacquin's and combination made by Choisy with *Ipomoea tuba* (Schlecht.) G. Don (*Calonyction album* (L.) House, to which the plate bears some close resemblance. Grisebach, however, cor-

rectly assigns it to *Ipomoea ventricosa* (Fl. 467. 1861), and, except for the somewhat exaggerated size of the corolla, the plate matches almost exactly specimens from Martinique, the type locality of *C. grandiflorus*, recently collected by Duss under the name of *Ipomoea ventricosa*.

IPOMOEA

Upon the authority of Dr. Urban, the species described by the writer as "*Ipomoea Fawcettii* Urban," is to be referred to *Convolvulus tenuifolius* Vahl. Unfortunately Vahl's *C. tenuifolius* was taken up in *Ipomoea* for *Ipomoea quinata* R. Br. to which *C. tenuifolius* is referred by the Index Kewensis, but upon what authority is difficult to imagine, since *Ipomoea quinata* is an Old World species, and the type locality of Vahl's species is given "Habitat in India occidentali." The proper nomenclature of this species should be as follows:

IPOMOEA TENUIFOLIA (Vahl) Kuntze, Rev. Gen. 446. 1891, as to syn. Vahl only.

Convolvulus tenuifolius Vahl, Symb. Bot. **3:** 33. 1794.

Ipomoea Fawcettii Urban; House, Ann. N. Y. Acad. Sci. **18:** No. 6, 216. 11 May, 1908.

Ipomoea carolina Griseb. Fl. 470. 1861. Not L.

Ipomoea tenuifolia Urban, Symb. Ant. **5:** 472. 20 May, 1908.

Represented in recent collections only by the Jamaican specimens collected by *Harris* (*8605*, 1904; *10010*, 1907).

The specimens referred to by the writer as *Ipomoea hirtiflora* Mart. & Gal. and later described under that name, apparently do not belong to that species. Hallier has identified *Ipomoea hirtiflora* Mart. & Gal. with *Jacquemontia lactescens* Seem. (*Thyella lactescens* House), of Central America and Panama.

Ipomoea villifera sp. nov.

"*Ipomoea hirtiflora* Mart. & Gal.;" House, Muhlenbergia **3:** 38. 1907; Ann. N. Y. Acad. Sci. **18:** No. 6. 193. 1908. Not *I. hirtiflora* Mart. & Gal. 1845.

Stout, twining, perennial: stems densely pilose with reflexed brownish hairs: leaf blades orbicular-ovate, entire or 3-lobed,

acute, densely appressed pubescent above, silky beneath, 6 to 12 cm. long, deeply cordate: peduncles 12 to 20 cm. long, several flowered: bracts ovate-lanceolate, 2 to 2.5 cm. long: sepals narrowly lanceolate, acuminate, pilose, 16 to 22 mm. long: corolla purple, slender, about 5 cm. long and 3 cm. broad, pilose without on the plicae and tube.

GUATEMALA: Near Jacaltenango, *E. W. Nelson 3579*, 1895, 3500-5400 feet altitude. Type in the U. S. National Herbarium.

Ipomoea minutiflora (Mart. & Gal.)

Convolvulus minutiflorus Mart. & Gal. in Bull. Acad. Brux. XII. **2**: 262. 1845; Walp. Rep. **6**: 541. 1847.

Ipomoea filipes Benth.; Meissn. in Mart. Fl. Bras. **7**: 274. 1869; House, in Ann. N. Y. Acad. Sci. **18**: No. 6, 239. 1908.

TYPE LOCALITY: Sola (Oaxaca) Mexico.

DISTRIBUTION: Thickets near the coast; western Mexico (Sinaloa, *Palmer 1647;* Guerrero, *Palmer 109*) to Guatemala (*Shannon*) and tropical South America (*Smith 1589; Fendler 2089; Spruce 886*). The type of *Ipomoea filipes* Benth. was collected "about Santarem, on the Amazon River, Brazil."

IPOMOEA OCHRACEA (Lindl.) G. Don, Gen. Syst. **4**: 270. 1838.

Convolvulus ochraceus Lindl. Bot. Reg. *pl. 1060.* 1827.

Ipomoea Curtissii House, Ann. N. Y. Acad. Sci. **18**: No. 6, 257. 1908.

TYPE LOCALITY: Gold Coast, Africa (type collected by Mr. James Murray).

DISTRIBUTION: Western tropical Africa. Introduced into Cuba, Panama aud Guyana.

IPOMOEA BRACHYPODA Benth. Bot. Voy. Sulphur 135. 1844.

Ipomoea iostemma House, Ann. N. Y. Acad. Sci. **18**: No. 6, 207. 1908.

MEXICO: Ixtapa, Jalisco, *E. W. Nelson, 4141*, 1897.

GUATEMALA: Zacapa, *Kellerman 7851, 7880*, 1908.

COSTA RICA: Nicoya, *Tonduz 13680*, 1900.

RIVEA

The species belonging to this genus (Choisy, Mem. Soc. Phys. Genev. **6**: 407. 1833) are high twining or climbing, perennial, woody vines with large, entire, petioled leaves. Ovary 4-celled, 4-ovuled; stigma 2-lobed, lobes oblong. Pericarp becoming dry and hard, shining, indehiscent, the internal dissepiments more or less united from the top downward.

Stictocardia Hallier f. Bot. Jahrb. **18**: 159. 1893.

Argyreia § *Pomofera* C. B. Clarke, in Hook. Fl. Brit. Ind. **4**: 184. 1885.

The type species is *Rivea tiliaefolia* (Desr.) Choisy, l. c., which Hallier makes the type of *Stictocardia*.

Rivea campanulata (L.)

Ipomoea campanulata L. Sp. Pl. 160. 1753; Thwait, Enum. Pl. Ceyl. 211. 1864.

Convolvulus tiliaefolius Desr. in Lam. Encyc. **3**: 544. 1789.

Convolvulus gangeticus Roxb. Hort. Beng. 13. 1814; Fl. Ind. **2**: 46. 1824.

Ipomoea tiliaefolia R. & S. Syst. **4**: 229. 1819.

Ipomoea benghaliensis R. & S. l. c.

Convolvulus campanulatus Spreng. Syst. **1**: 608. 1825.

Ipomoea gangetica Sweet, Hort. Brit. ed. 2, 288. 1830.

Convolvulus melanostictus Schlecht. in Linnaea **6**: 737. 1831

Rivea tiliaefolia Choisy, in Mem. Soc. Phys. Genev. **6**: 407. 1833.

Ipomoea melanosticta G. Don, Gen. Syst. **4**: 271. 1838.

Convolvulus platypeltis Spanoghe, in Linnaea **15**: 338. 1841

Argyreia tiliaefolia Wight, Ic. Pl. Ind. **4**: 12. 1850.

Stictocardia tiliaefolia Hallier f. Bot. Jahrb. **18**: 159. 1893.

TYPE LOCALITY: India.

DISTRIBUTION: West Indies, tropical America, Africa and Asia.

ILLUSTRATIONS: Wight, Ic. Pl. Ind. **4**: *pl. 1358;* Rheed. Mal. **11**: *pl. 56.*

Biltmore, North Carolina.

PUZZLES IN SYNONYMY

By C. R. Orcutt

Synonymy will probably always be a more or less vexatious study for the naturalist, and one that cannot be wholly ignored. It is easy to formulate satisfactory theories and rules, but not always easy to adapt them to actual conditions that may confront one, and a relation of a few experiences may prove not uninteresting to others.

Years ago, in my early explorations of the mesas and canyons around San Diego, California, I discovered that two very distinct species of *Rhus* existed, where only one was recognized by the botanical world, and I jumped to the conclusion that Thomas Nuttall, who had given the names *Styphonia integrifolia* and *S. serrata* to a species which he had collected at San Diego, had been wronged by the suppression of the latter species. I still believe that this was a natural and justifiable conclusion, judging from the circumstantial evidence furnished by the literature at that time extant. Torrey had even figured a leaf of my "integrifolia" (Pac. R. R. Rep. **9**: *pl. 2*), and left no room for doubt in my mind that the commoner shrub around San Diego should be known as *Rhus serrata*, and my new discovery was Nuttall's original "integrifolia." A letter to Dr. Sereno Watson, accompanied by specimens, led to the information that Nuttall's type specimens of both *integrifolia* and *serrata* were in existence in the Gray herbarium, and were undisputably based on variations in the foliage of one species, and my specimens of supposed *integrifolia* were in reality a new species, to which he gave the name *Rhus ovata*.

I can no longer correspond with Parry, Engelmann, Gray, Watson, and Vasey, and a new school of botanical writers, with different views, now occupy the botanical arena. A set of more or less arbitrary rules has led to the displacement of many names familiar to an older generation by others resting on their law of priority. Priority is a good law, but it has been too loosely applied I fear in many cases without corresponding advantage to the cause of science.

A case in hand is another of Nuttall's names. *Cactus californicus*, the *Cereus californicus* of Torrey and Gray's Flora. There can be no reasonable doubt in my mind that Nuttall found our now familiar velvet cactus (Engelmann's *Cereus Emoryi*) at San Diego, and that it is the only plant now growing in the vicinity of San Diego answering to the description given by Nuttall. But no specimens collected by Nuttall are known to me to exist, and the circumstantial evidence available to me can not be more complete than that I possessed in the case of the two species of Rhus. It is possible, but not reasonable to suppose, in view of our present knowledge, that Engelmann was right in his supposition that Nuttall's *Cereus californicus* was based on plants which he had named *Opuntia serpentina*. *Opuntia serpentina*, as it commonly exists around San Diego, is not an erect growing species; *Cereus californicus* was described as erect, with yellow flowers and dry spiny fruit; *Cereus Emoryi* is erect in habit, with yellow flowers and spiny fruit which is at first juicy with a rich red pulp, but in age becomes dry, and may have been so found by Nuttall.

Now, if I am to use my own judgment, and follow strictly the law of priority, I must reinstate Nuttall's name *Cereus californicus*, and treat Engelmann's *Cereus Emoryi* as a synonym, after more than fifty years of recognition. I intend to continue to write *Cereus Emoryi* as the name of this plant, with *C. californicus* as a synonym; but another critical botanist has acknowledged that I am right in my recognition of Nuttall's plant, and possibly his name will be reinstated upon the revision of the genus.

In traversing the desert plains of Arizona in 1902, I found a tiny cactus growing in the shade of bushes on the Gila, the slender cylindrical stems curiously proliferous from the base, which I decided to be a new species, naming it *Mammillaria Thornberi*, for Professor J. M. Thornber, who had found the plant almost at the same time. It has since been sent to me by Dr. R. E. Kunze, who reported it as quite rare. I collected more than a thousand plants, but unfortunately all have perished from lack of suitable care. I am now convinced that this

is identical with the plant described by Engelmann in the Cacteae of Emory's Reconnoissance, under the name of *M. fasciculata.* No type specimens of *M. fasciculata* are known to exist, and the figure and description are inadequate, yet they leave no doubt in my mind, and I feel justified in treating *M. Thornberi* as a synonym.

One prominent American botanist, deciding upon segregating four new species from what had before been recognized as one, found himself unable to determine to which of his four species the accepted name should be given, cut the gordian knot by describing all four as new species, leaving it to future botanists to determine which of his four names should be relegated to synonymy. There is no doubt about this incident, as the man told me the tale himself, but I hope the practice has not been a common one.

In the study of the Cactaceae there are many instances where one feels inclined to treat the bulk of the older published names as *nomina nuda* and begin all over again. It is impossible for us in a great many cases to determine what plant was originally given a stated name—*Opuntia tuna* being a well known instance. *Mammillaria elegans*, one of our best known cacti in cultivation, certainly does not agree with De Candolle's description, and the difficulties of a reconciliation can be seen by a comparison of the original with Schumann's more recent description. I have had several distinct species given this name by those who have given special study to cacti.

I believe that many of the new species in Cactaceae published in recent years are based on plants previously described. But where any doubt exists, and where no type has been preserved, it would be well for botanists to recognize as law the rule that the older names should not be revived at the expense of well established names. This rule would save us from the re-establishment of many doubtful generic names as well as specific names, and preclude the use of such a name as *Cactus* from future generic application—a name pretty well worn out.

San Diego, California.

STANLEYA VIRIDIFLORA

By A. A. Heller

4. *S. viridiflora* (Nutt. mss.): "erect, glabrous; leaves cuneate-obovate, acute, entire, the radical ones with a few runcinate teeth towards the base; petals linear, and, as well as the calyx, herbaceous.

"Bare shelving hills on Ham's fork of the Colorado of the west, and in other parts of the Rocky Mountains, towards the sources of Lewis's River; also on the head waters of the Platte. July-Aug.—Root very stout and cylindrical, penetrating deeply into the earth; the taste bitter and nauseous. Stem simple, 3-4 feet high. Radical leaves clustered, about a span long, occasionally almost pinnatifid at the base; cauline ones entire, rapidly diminishing in size upward, so that the superior part of the stem is naked. Raceme very long (sometimes 2 feet in length), crowded with flowers. Calyx and corolla greenish-yellow, and not showy. Sepals long and linear. Petals linear; the lamina scarcely longer than the claw. Anthers very long and linear. Immature fruit smooth; the pedicel about half an inch long: stipe about an inch in length, nearly as long as the silique." *Nutt.*

The above is the description of *Stanleya viridiflora* Nutt. in Torrey and Gray's Flora **1**: 98. 1838. This description is so far the best one of the species. In the Synoptical Flora **1**: Part 1, 105, under the generic key, the petals of *Stanleya* are said to be "long and narrow, spatulate, slender-clawed." On page 178, the generic description says "cream-colored or yellow flowers," and on the same page, under the description of *S. viridiflora* "flowers greenish," is all that is mentioned concerning the flowers. We are left to infer that the flowers of all the species are "long and narrow, spatulate, slender-clawed," and that there is no more to be said about them, except to note variations in color.

The note at the end of the description of *S. viridiflora* in the Synoptical Flora says that "the suggested *S. collina* of Jones, l. c. [Zoe **3**: 283] appears to be the typical form of the species."

But is it? Mr. Jones gave a description of his plant which enables me to decide that I have the same thing, collected last August on the Ruby mountains on the ridge above Cave Creek post office, Elko county, Nevada, in limestone, growing about the base of cliffs, elevation 7600 feet. Jones described the flowers of his plant as follows: "Sepals in the bud greenish-yellow, after anthesis purple (usually) and reflexed, linear-oblanceolate, obtuse, concave, almost hooded; blade of petals crumpled crosswise, edges jagged, linear, ½ line wide, yellowish-green, inconspicuous, 4 to 6 lines long, and thin, claw thick, fleshy, triangular-subulate, 6 lines long and a line wide at the saccate base, glabrous, whole petal just equaling the filiform filament."

This describes my plant very well, especially the "blade of petals crumpled crosswise," which is very characteristic. The only discrepancy is that in my plants the blade is almost too wide at the apex to be called "linear," but somewhat oblanceolate would be better.

Had I collected this plant only I might not have doubted the statement in the Synoptical Flora that Jones' plant is typical *S. viridiflora*. But along the railroad near Wells, Elko county, Nevada, elevation 5630 feet, was found a plant of different aspect, with long (2 dm.) basal oblanceolate leaves, "attenuate below into long flat winged" petioles.

The striking difference is in the flowers. The petals of this plant are greenish, linear, about 17 mm. long, a little over 1 mm. wide at the base for a distance of 3 mm., then reduced to 1 mm. or less for the remaining length, being practically linear, the edges entire, not "jagged," as in the other plant, and no sign of the "crumpled crosswise," but merely several longitudinal veins. The petal is apparently twisted at the middle, and seems to be very slightly narrower there than either above or below, but so little that the difference is almost imperceptible.

That these are two distinct plants there can be no doubt, but are either of them *S. viridiflora*? The plant from near Wells most nearly answers to the description, but the lamina of the petal is not "scarcely longer than the claw." It is five times longer, if we allow that the lower, broader portion may be called a claw.

Nuttall's specimens should be represented in either the herbarium of the Philadelphia Academy of Natural Sciences, in the Torrey herbarium at the New York Botanical Garden, or in the Gray herbarium. Some one of our eastern friends who has access to the type material could do no better work than give us a more complete description of *S. viridiflora* (provided a better one is necessary) accompanied by an illustration of Nuttall's specimen and enlargements of the floral parts.

THE WILD PHLOX

By A. A. Heller

Phlox Stansburyi (Torr.) Heller, Bull. Torr. Club **24**: 478. 1897.

P. speciosa var. (?) *Stansburyi* Torr. Bot. Mex. Bound. 145. 1859.

P. longifolia var. *Stansburyi* Gray, Proc. Am. Acad. **8**: 255. 1870.

The handsome little plant which furnishes the subject for our illustration is common on gravelly hills about Reno, beginning to bloom early in April, and from that time on until the middle of May flecking the hills with vivid spots of pink. Occasionally plants, or even whole colonies of plants bearing white flowers are found. As shown in the illustration, hundreds of blossoms are often found massed together. It is not true *Phlox Stansburyi*, but apparently the plant known as *P. Stansburyi* var. *brevifolia* (Gray) E. Nelson, and differs considerably in appearance, notably in the shorter and broader leaves and shorter flowers. It is probably distinct. Typical *Stansburyi* belongs to an entirely different floral region, having been collected many years ago on "gravelly hills near the Organ Mountains, New Mexico."

The name Phlox, although botanical, has come to be well known in common every-day language. The ones best known are those derived from the perennial fragrant ones, and the bright and various colored annual *Phlox Drummondii*, the best known of all the species, as it has been in cultivation for a long time.

A Mr. Drummond, who collected extensively in Texas, sent seeds to England early in 1835, and in October of that year *Phlox Drummondii* was described and figured by Hooker in the Botanical Magazine. The flower was originally described as "pale purple without, within, or on the upper side, of a brilliant rose-red or purple, varying exceedingly on different individuals in intensity and in their more or less red or purple tinge, the eye generally of an exceedingly deep crimson." One garden form of this species has deeply cut petals, and is called "star phlox."

P. paniculata and *P. maculata* are two perennials that have been extensively cultivated, the former especially having furnished many garden forms. It is a stout erect plant, two to four feet high, the flower usually deep pink in the wild state. It is found in woods and thickets in most of the eastern states from Pennsylvania south to Florida and west to Kansas.

P. maculata is a smaller plant, but with the same upright habit. The stem is usually purple mottled, whence the name. The leaves of this species are broader, thicker, and of a deeper green than are those of *P. paniculata*.

All told, there are about sixty species of *Phlox* in North America, all of them handsome plants, apparently only five of them annuals, and all of these five are natives of Texas.

By far the greater number of the species in the genus are found from the Rocky mountains westward fully two thirds of them occurring in that region. At the higher altitudes especially are found the low matted forms with an abundance of flowers almost concealing the short leaves.

Nevada Species

Besides the form illustrated, the following are known to occur in Nevada:

PHLOX LONGITUBA Heller, Muhlenbergia **2**: 228. 1905.

Phlox superba Brand, Pflanzenreich IV. Fam. **250**: 67. 1907.

This is a handsome species with pink or often salmon-colored flowers, the tube nearly an inch and a half in length. The slender stems are suffrutescent at base, and often attain a height

of a foot and a half when growing among the desert shrubs. Plants growing out in open ground away from bushes are much lower and more diffuse, the woody base less pronounced. The type was collected near Bishop, Inyo county, California, but we now have it from Goldfield, this state. Our Nevada specimens differ from the type only in having the upper surface of the leaf less pubescent. This phase of the species has been described by Brand as *P. superba*, the type collected at Tonopah, not far from Goldfield.

The following belong to the group of low and prostrate matted perennials whose branches and short crowded leaves are almost concealed by the numerous white or purple tinged flowers. They occur at altitudes of 6000 feet and more.

PHLOX DOUGLASII Hook. Fl. Bor. Am. **2**: 73. 1838.

The leaves of this species are smooth or nearly so, sharply pointed. The calyx is sparsely lanate-ciliate, and the flowers have the tube somewhat hairy inside at the base. It is represented by specimens from near Carson, and from Peavine mountain just northwest of Reno.

PHLOX CANESCENS T. & G. Pac. R. R. Rep. **2**: 122. *pl. 6.* 1855.

We have specimens from several stations near Reno, and from Paradise valley, Humboldt county. The species is readily distinguished by the woolly pubescence and the short, rigid, recurved-spreading leaves.

PHLOX CONDENSATA (Gray) E. Nelson, Rev. West. N. A. Phlox. 13. 1899.

This has been found at elevations of 10000 feet and more on the Clover mountains in the eastern part of the state, and on Mt. Rose near Reno at similar elevations. The leaves are much crowded, hispid ciliate and glandular. The tube of the flower is twice the length of the calyx.

There are other species in the herbarium from Nevada, but their identity is not sufficiently enough established to warrant listing them here.

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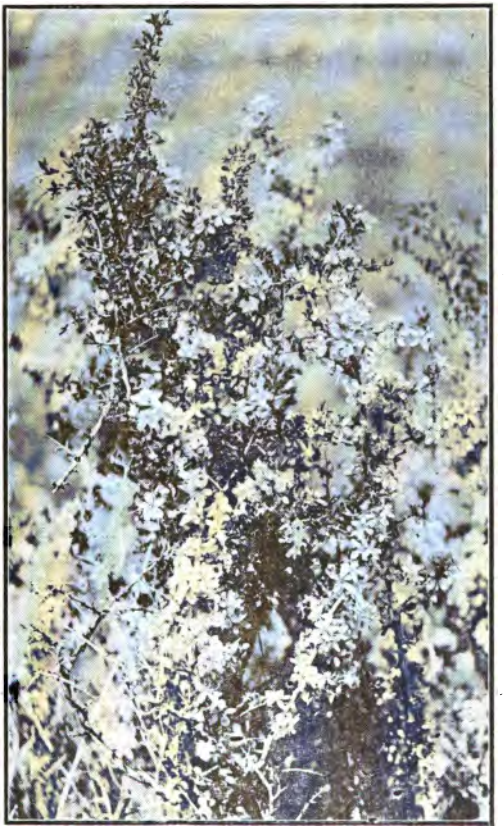

The Wild Almond (*Emplectocladus Andersonii* (Gray) Nelson and Kennedy

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MORE SOUTHWESTERN CASTILLEJAS

By Paul C. Standley

Since writing the description of *Castilleja Blumeri* and the note upon *C. patriotica*, published in the March number of Muhlenbergia, the writer has received from Mr. Blumer several other plants of this genus from southern Arizona. In the lot were included specimens of *C. minor* A. Gray, *C. integra* A. Gray, and *C. linariaefolia* Benth. All these were collected in the Chiricahua mountains. Besides these, collections were sent of two other members of the genus, both of which appear to be new. They were not collected in quantity, and so were not distributed in the sets recently sent out by Mr. Blumer.

Castilleja retrorsa sp. nov.

A low perennial: stems slender, 2 dm. high or less, branched from the base, finely retrorse-pilose throughout: leaves entire, linear, 25 mm. long or less, dull green, rather densely puberulent on both surfaces: bracts entire, linear or lanceolate, yellowish-scarlet: flowers rather few and crowded, somewhat divaricate, almost or quite sessile: calyx 3 cm. long or less, tubular, scarlet, soft pubescent, cleft in front for almost half its length, obscurely cleft behind: corolla about 4 cm. long, hence conspicuously exserted, sparingly pubescent, greenish-yellow, the galea slightly shorter than the tube.

The specimens that I have of this plant are scarcely more than fragments, yet the plant appears so distinct that it seems worth recording. It reminds one of *C. patriotica*, but differs from that species in its pubescence, the type collection of the latter being glabrous except in the inflorescence, and there it

has much shorter pubescence than the Arizona plant. The proposed species is always more slender, its leaves are entire, while those of *C. patriotica* are incised, and it differs in having the galea shorter than the tube of the corolla. The plants appear somewhat depauperate. They were collected by Mr. J. C. Blumer (no. 2132) on a rocky spur north of Wilgus ranch, in the Chiricahua mountains, Arizona, September 2, 1907, growing in high, dry places in rhyolitic soil, altitude 6000 feet.

Castilleja cruenta sp. nov.

Perennial: stems mostly solitary, simple, about 3 dm. high or often less, rather stout, with abundant villous pubescence: leaves thick, entire, the lower linear-lanceolate, about 6 cm. long and 6 mm. broad, 3-nerved, acute, rough pubescent beneath, scabrous above, the upper leaves much broader and shorter and more pubescent: bracts entire, rather broadly obovate, obtuse, densely pubescent, green at the base, crimson above for about half their length or some of the lower ones entirely green, 3 cm. long or less, longer than the flowers: flowers densely clustered, almost or quite sessile: calyx cylindrical, 18 to 22 mm. long, densely pubescent, dull green, slightly cleft behind, deeply cleft in front (for 7 or 8 mm. or twice as deeply as behind), the lobes broadly obtuse and entire: corolla slightly shorter than the calyx, the galea and tube about equal in length, the lip very short and inconspicuous with three sharp teeth: capsule ovoid, about 8mm. long, with a beak 3 or 4 mm. long, glabrous.

Mr. Blumer determined this as *C. laxa* A. Gray, and it resembles that species more than any other. It differs, however, in its more abundant and longer pubescence, its included corolla, and the entire lobes of the calyx. Excellent specimens were collected by Mr. Blumer (no. 2133) on a rocky spur north of Wilgus ranch in the Chiricahua mountains, Arizona, September 2, 1907, growing in rhyolitic soil, altitude 6000 feet.

Types of both these proposed species from Arizona, as well as those from New Mexico, are deposited in the herbarium of the New Mexico Agricultural College.

The first plant collected by the writer during the summer of 1908 in the Pecos River National Forest was a *Castilleja*. It is closely related to *C. confusa* Greene, but the specimens were finally distributed as a new species. Through carelessness the name assigned to it on the labels was one already used by Dr. E. L. Greene. I wish to describe it here under another name:

Castilleja inconstans sp. nov.

Perennial: stems mostly solitary, stout, simple at the base but usually branched above, stiffly erect, 5 dm. high or less, with abundant, short, stiff pubescence throughout, or sometimes almost glabrous about the middle internodes: leaves linear-lanceolate, entire, 60 mm. long and 9 mm. wide or mostly smaller, rather bright green, acute or acuminate, 3-nerved, scabrous especially beneath, the upper leaves usually slightly wider than the lower ones: bracts about as wide as the leaves but shorter, 15 to 25 mm. long, with two pairs of long, linear, acute lobes, the central lobe being acutish and conspicuously toothed, the lateral lobes often toothed also, scabrate or short-villous, scarlet for about half their length: calyx about 15 mm. long, almost equally cleft before and behind, the divisions each with two long, linear-lanceolate, attenuate teeth: corolla exserted, about 20 mm. long, galea much shorter than the tube, the lip very short and inconspicuous: capsule ovoid, about 1 cm. long, with a beak about 2 mm. long, glabrous.

Type collected at Winsor's ranch, on the headwaters of the Pecos river, June 29, 1908, *Standley 4000*, altitude about 8400 feet. The plant is common in this region, growing on rather sunny hills under pines or even higher up among the aspens. Other collections seen, all from this same region, are as follows: Rio Pecos two miles below Winsor's 1908, *Standley 4244;* Harvey's upper ranch, 1908, *Standley 4687*, altitude 9600 feet; Santa Fe mountains, 1898, *Maltby and Coghill 2;* upper Pecos river, 1904, *Mrs. W. H. Bartlett;* Harvey's ranch, 1899, *Cockerell.*

C. confusa is common in this same region, but is readily distinguished in the field by its different aspect. It reaches higher levels, too, for the writer collected it on Pecos Baldy at

about 12000 feet. This proposed species is distinguished by its more erect and stouter, stiffer habit, *C. confusa* being taller, more slender, and rather weak and lax; by the much more abundant and stiffer pubescent stems, the smaller flowers and bracts, and the more divided bracts.

A rather interesting variant of this plant was noted. In one clump growing with the common scarlet-bracted form were found a number of plants with bright yellow bracts; otherwise they did not differ from the type form. This same mutant was collected by Mrs. Bartlett in 1905 in about the same locality. It is not the same as *C. confusa* x *acuminata* described by Professor Cockerell, although the plant there called *C. confusa* is the one here described as new.

In the Sacramento and White mountains of southern New Mexico is another *Castilleja* that has long been known as *C. affinis* H. & A. That species was first collected in California, and one hardly expects to find a Californian plant in New Mexico. Careful examination has convinced the writer that the New Mexican plant is distinct, and it is here described as

Castilleja Wootonii sp. nov.

An erect perennial: stems stout, often reddish, single or clustered, 6 to 10 dm. high, simple below but amply branched above, glabrous in most parts, but soft pubescent near the base and with abundant, short, white, villous pubescence upon the inflorescence: leaves simple or frequently with two linear, acuminate, divergent lobes, when simple linear-lanceolate, acute, 7 cm. long or less, bright green, mostly glabrous, 3-nerved: bracts 25 mm. long or less, with two or rarely four divergent, linear, lateral lobes which are about twice as long as the terminal one, the terminal lobe narrow, entire, and acute to obtuse, short villous along the veins, scarlet above for half their length: flowers short pedicelled, numerous in a spike which is dense and short at first but later becomes elongated: calyx 25 mm. long or less, cleft in front for one-third its length or more, behind about half as deeply, the lobes each with two linear-lanceolate, acuminate teeth, short villous along the veins: corolla 30 mm. long or

less, soft pubescent along the back, the galea shorter than the tube, the very short and inconspicuous green lip with three sharp teeth: capsule ovoid, about 1 cm. long, with a short beak, glabrous.

This does indeed seem to be related to *C. affinis* because of the form of the calyx. From that species it is distinguished by the long and very acute calyx segments, the shorter pubescence, and the different bracts and leaves. Type collected at Gilmore's ranch on Eagle creek in the White mountains of New Mexico, August 25; 1907, *Wooton and Standley 3411*, altitude about 3400 feet. We have the following additional eollections from the White mountains: Mescalero reservation, 1905, *Wooton;* divide above the Mescalero agency, 1895, *Wooton;* White Mountain Peak, 1897 and 1901, *Wooton.* From the Sacramento range, which is the southern continuation of the White mountains, we have a collection from Cloudcroft, 1899, *Wooton.* This is the tallest of any of the Castillejas found in New Mexico, except possibly *C. linariaefolia.* It frequents the pine clad mountain sides chiefly, but sometimes occurs on the more open slopes in the "parks."

In the collection of plants made by Mr. O. B. Metcalf in 1904 about the Black range was a *Castilleja* that seemed to be new. In our herbarium it was represented by several collections from the Mogollon mountains. Professor E. O. Wooton and myself assigned it a name which was used upon the labels sent out with the sets. Dr. Rydberg has written us that he finds no essential difference between this plant and *C. lauta* A. Nelson, originally described from Wyoming. Upon comparison with specimens of this species received from Colorado and Utah, our plant does seem to be the same, although scarcely any other plants of the northwestern states can be found in the mountains of southwestern New Mexico.

Castilleja integra A. Gray, was first collected in the Organ mountains of southern New Mexico. It is distributed over a wide area, occurring almost throughout this Territory, as well as in Texas, Colorado, and Arizona. It is a variable species in

New Mexico. In the Organ mountains it grows at an altitude of about 6000 feet, on shaded slopes, where it is a tall plant and but little branched. Farther north in the region about Santa Fe it is very low and much branched, growing on the open mesas and foothills, but at about the same altitude. The size of the flowers and bracts varies noticeably in different plants, the forms of northern New Mexico running into the variety *gloriosa* (Britton) Cockerell. Most of these variations, perhaps, are due to climatic conditions, especially temperature and the water content of the soil.

In the range of mountains where *C. integra* was first found there occurs another Castilleja which somewhat resembles that common species. We have specimens of but three collections in our herbarium, and the plant seems to be much rarer than *C. integra*. It is here described as

Castilleja organorum sp. nov.

An erect perennial: stems clustered, or branched from the base, sparingly branched above, about 4 dm. high, stout, with rather stiff, spreading or often retrorse pubescence throughout, the pubescence above and upon the inflorescence being softer and even slightly matted: leaves numerous, linear, with one or three nerves, 45 mm. long or less, finely scabrate on both surfaces: flowers rather few in a short and rather dense spike: bracts oblong, entire, broadly obtuse, 2 cm. long or less, scarlet for two-thirds their length, rough puberulent: calyx 16 mm. long or less, tubular or somewhat distended below, equally cleft before and behind, the lateral divisions each divided into two linear-lanceolate lobes, scarlet above and greenish below, rough puberulent: corolla slightly exserted, the galea half as long as the tube or less, bright green faced with scarlet, the rather conspicuous lower lip consisting of three bright green, strongly incurved teeth: capsule about 12 mm. long, ovoid, with a short beak.

The type was collected on the rocky sides of the Organ mountains not far from Van Patten's Camp, June 9, 1906, by the writer, altitude about 5700 feet. Other specimens from the same range are as follows: Filmore canyon, September 23, 1905,

Wooton and Standly; west side, near San Augustine ranch, August 16, 1895, *Wooton.* The plant is related to *C. integra*, but differs in its very distinct pubescence and smaller flowers and bracts. It is not very distant from *C. patriotica* and *C. retrorsa*, but is distinguished by its different calyx and corolla.

Herbarium of the New Mexico Agricultural College.

A NEW LATHYRUS FROM NEW MEXICO

By E. O. Wooton and Paul C. Standley

Lathyrus oreophilus sp. nov.

Perennial, climbing or ascending by rather short but well developed 3-parted or simple tendrils: stems rather slender, less than 5 dm. high, sharply angled, finely puberulent throughout, usually simple: leaves with 3 to 5, usually 4, pairs of leaflets, the rachises sparingly puberulent; leaflets elliptic, about 40 mm. long and 15 mm. wide, with very short petiolules, rather thick, obtuse at both ends, mucronate at the apex, strongly veined, rather bright green above and paler beneath, more or less puberulent beneath, glabrate above; stipules semi-sagittate, very small and inconspicuous: racemes about as long as the leaves, 6 to 15-flowered: flowers about 15 mm. long, on pedicels about 3 mm. long, the wings and keel bright rose color, the standard darker and drying purple: calyx 8 mm. long or less, including the teeth, densely pubescent, the lowest tooth linear-lanceolate and two-thirds as long as the calyx, the lateral teeth much shorter and triangular-lanceolate: fruit not seen.

This is very unlike any other species of this genus found in New Mexico, its chief peculiarities being its pubescence and the small size of its handsome flowers. The type was collected in James canyon, about four miles east of Cloudcroft, in the Sacramento mountains of New Mexico, June 26, 1899, by *E. O. Wooton.* The plant was very abundant in this one locality, growing along fence rows about a piece of land that had been cleared recently.

Herbarium of the New Mexico Agricultural College.

A REMINISCENCE OF J. G. LEMMON

Sierra Valley, Christmas, 1873.

Mrs. Alf. Doten,
Gold Hill, Nev.

The promise to send you flowers has not been forgotten, but I could not attend to it before.

Now I am in the midst of delight and flowers—having chartered a church by the week and spread them in the pews for convenience of classification.

Am very busy, and must beg your pardon for sending so small a selection. Hope they will arrive safely. Please acknowledge receipt. How do you like "Scenes in the High Sierras" commenced in the 1st of Nov. No. of *Pacific Rural?* Will thank you for criticisms. With many remembrances of the kindnesses of your husband, I remain,

Your casual acquaintance,

J. G. LEMMON.

P. S. Am in receipt of a pamphlet from Dr. Asa Gray of Cambridge, the father of botany on this continent, containing a very pleasing announcement—the fact that a certain plant of this valley has been named *Astragalus Lemmoni* in honor of my pioneer efforts in inspecting this valley.

The honor is too great for me to wear modestly as I should, but if diligence in future is a guaranty I mean to deserve it. Ho, for Shasta and Oregon next season.

[We had hoped ere this to have published an extended sketch of the late Mr. J. G. Lemmon, whose name is so intimately connected with the development of western botany, but have been unable to do so. However, through the kindness of Professor S. B. Doten, of the Nevada Agricultural Experiment Station, we are enabled to print the above letter, written to his mother years ago, when Mr. Lemmon first made his acquaintance with the wonderful flora of the Pacific coast. It shows the remarkable enthusiasm that he had for his chosen work, not only in the beginning, but even up to the end.—EDS.]

THE WILD ALMOND

By A. A. Heller

Emplectocladus Andersonii (Gray) Nelson and Kennedy, Muhlenbergia **3**: 139. 1908.

Prunus Andersonii Gray, Proc. Am. Acad. **7**: 337. 1868.

Amygdalus Andersonii Greene, Fl. Fran. 49. 1891.

Early in May the hills about Reno present considerable areas of bright pink bloom, for this shrub is abundant in many places, usually frequenting gravelly and stony slopes. It is even found within the city limits where the conditions are suitable for its growth.

As may be surmised by a glance at the Latin names which have been given to it, it is a member of the Amygdalaceae or stone-fruited section of what is broadly termed the rose family. It is a shrub, commonly three or four feet high, but occasionally six or seven feet, with short and stiff, somewhat spiny branches and grey, rather smooth bark. The shrubs are somewhat gregarious, due no doubt to the limited facilities for seed dispersal, often forming extensive thickets, and when in full bloom are very ornamental, but the flowers have a decidedly disagreeable odor. The leaves are comparatively thin, prominently veined, dull green, and commonly spathulate or oblong, an inch or less in length, but on some bushes they are nearly as broad as long. The flowers are about a half inch broad, some shade of rose or pink, as they vary from almost white to bright rose. The petals are not unlike the leaves in shape, but commonly a little broader in proportion to the length.

The fruit is almost orbicular in outline, nearly a half inch across, somewhat flattened or compressed. The thin outer fleshy covering, which has a thickness of a millimeter or slightly more, is dehiscent exactly as in the cultivated almond. The stone has one margin raised into an acute edge, and a millimeter or more below on either side is a second but less prominent ridge. The other margin is not so wide or prominent, and is simply furrowed. The stone is pointed at each end, more prominently so at one end than at the other, and the sides are slightly roughened.

In the Botany of California, **1**: 168, the following note is found: "The fruit more nearly resembles the peach than does that of any other of our species. This whole section [Emplectocladus], indeed, of five species confined to the interior of the continent and to Mexico shows the nearest approach in the American flora to the old genus *Amygdalus* of the Old World."

One cannot help wondering why the people who recognized the relationship of this plant to *Amygdalus* should persist in calling it a plum. But then when we remember that most botanists still include both plums and cherries in the same genus, this position need not cause much surprise.

The plant was named in honor of Dr. C. L. Anderson, who at one time lived at Carson City, and collected plants in that vicinity between 1863 and 1866. This was one of the numerous plants he sent to Dr. Gray at Cambridge to be named.

We do not know the exact limits of its range, but in Zoe **4**: 151, Mr. Brandegee says it "grows scattered through the Sage Brush nearly to Susanville, California," and Coville, in Cont. U. S. Nat. Herb. **4**: 90, records it from as far south as Walker Pass on the eastern slope of the southern Sierra Nevada in Kern county, as well as to the east of that place in the Panamint and Coso mountains in Inyo county, California. I have collected it in the upper part of Inyo county in Owen's valley.

In point of distribution, so far as known, it is confined to a narrow strip in western Nevada and eastern California, extending on the north to Susanville, Lassen county, California, and on the south to lower Inyo county, a distance of some 300 miles, and is most plentiful in the region where it was first discovered.

Emplectocladus fasciculatus Torr. the type of the genus, and the only other species named under it, is a species of much more southern distribution, occurring from southern California east to southern Utah. Fremont first collected it in either southern California or southern Nevada. The flowers are said to be very small, white, the petals being elliptical-lanceolate in fertile flowers and ovate in sterile ones. The fruit is apparently the same in appearance as that of *E. Andersonii* but the stone is said to be subglobose, smooth, obtuse on both margins.

SOME OF DR. KELLOGG'S SPECIES

BY A. A. HELLER

Dr. Kellogg was one of the founders of the California Academy of Sciences, and contributed many botanical articles to its first series of Proceedings. The second volume especially is replete with them, and while consulting this volume for descriptions of plants originally collected in Nevada and described by him, I became impressed with the fact that many of his species were unjustly suppressed. In Zoe **4**: 1, the statement is made that "he published at various times during his residence, several genera, two hundred and fifteen species, and several named varieties. The lapse of time and better knowledge have left valid less than sixty of these."

While some of his descriptive terms are occasionally misleading, Dr. Kellogg described his species remarkably well, and in addition many of them were published with illustrations. It seems to me that if those who made such a wholesale reduction of his species had used both their judgment and their eyes, the botanists of to-day who have to deal with plants from the region where Dr. Kellogg's types originated, would be in much less danger of committing errors. Names that are put into synonymy are apt to be overlooked, especially if one does not have access to the original descriptions or the types, and more synonyms, *real ones*, are liable to be made.

I here present some of his species that undoubtedly must be reinstated, and others about which more information is needed.

CALLIPRORA CAURANTEA Kellogg, Proc. Cal. Acad. **2**: 20. 1859.

Calliprora scabra Greene, Erythea **3**: 126. 1895.

This was put down as a synonym of *Brodiaea ixioides* by Watson in Proc. Am. Acad. **14**: 238, and in Bull. Cal. Acad. **1**: 148 by Mrs. Curran as probably "a stout form of *Brodiaea gracilis* Watson." While Kellogg omitted some of the most important points about the floral structure, a comparison of his description with that of *C. scabra* Greene shows that they are undoubtedly the same, and the types of both came from the same

region. Kellogg's type was from "Mariposa." The fact that the plant was described as a *Calliprora* at once dismisses the guess that it might be a "stout form of *Brodiaea gracilis*." Dr. Kellogg was undoubtedly familiar with the considerable differences in floral structure of the genera *Calliprora* and *Triteleia*, and would hardly make such an evident error. I have collected the plant in Kern county, California, and it is certainly distinct from *C. ixioides*. The original spelling of the specific name is here used. Wherever cited in literature it is spelled *aurantea*.

SISYMBRIUM REFLEXUM Kellogg, Proc. Cal. Acad. **2**: 101. *f. 29*. 1861.

Wherever mentioned, this is said to be the same as *Arabis Holboelii* Hornem. But the latter species is now pretty generally conceded to be absent from the flora of the United States, the original being from Greenland. I have not been able to determine to what species of *Arabis* it really belongs, but it hardly seems possible that the plant has escaped a later description and name unless it is an extremely local species. The type was collected near Washoe, Nevada, a point between Reno and Carson, but in a region little explored botanically. The plant is "light greenish gray, with short white forked or branching hairs throughout," and the calyx is described as "erect at length recurved spreading; purplish green, (slightly purplish at the base) sepals somewhat spatulate, subacute, half shorter than the petals, equal at the base or not saccate." The petals are described as "beautiful deep rose purple on the lamina, the claws white, cuneiform-spatulate, unguiculate, claw scarcely a little longer than the sepals, five to seven-nerved." The pod is about two inches long, "straight or a little curved, strongly reflexed against the stem, pedicels scarcely three-eighths of an inch long." Whatever the plant may be, the name is preoccupied by the earlier *Sisymbrium reflexum* of Nuttall.

ANNOUNCEMENT

A new edition of the Catalog of North American Plants is in preparation. Thus far 68 pages have been printed, and other parts will follow as fast as possible. In all there will be about 300 pages. Since a considerable time must elapse before the work can be completed, the 68 pages and other parts as soon as issued, will be sent to those who wish to have them in that form, for $1.25, payment to be sent with the order.

When completed the Catalog may be had in neat green cloth binding for $1.50 postpaid. Orders for the cloth bound book may be sent in now, payment to be sent when the book is delivered.

A. A. Heller,

539 West 5th street, Reno, Nevada

Change of Address

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A. A. HELLER.

Volume 5 Number 7

MUHLENBERGIA

JULY, 1909

Editors: A. A. HELLER and P. BEVERIDGE KENNEDY

The Alpine Spruce (*Tsuga Mertensiana* (Bong.) Carr.)

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University of Nevada,
Reno, Nevada

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Volume 5 August 5, 1909

MUHLENBERGIA

THE FLORA OF THE ARROYO TERQUISQUITE

By Fred M. Reed

Eastern and foreign botanists often remark upon the extent and variability of our California flora, especially of this semi-arid part, and even the portions considered to be really desert.'

Perhaps it will not prove uninteresting to give the results of a study of a small area in this so-called arid region. For some years past I have been collecting and watching the changes in the plant life of a near-by typical California arroyo locally named the Arroyo Terquisquite, a name supposed to be of Indian origin, but no hint of its significance has been obtained either from the earliest settlers or from the Indians themselves.

This arroyo is simply a gully of erosion across the mesa lying between the Box Springs mountains and the Santa Ana river. Its branched heading in these hills is at an altitude of about 1500 feet, and from these hills the arroyo takes its zigzag way across the mesa with its level floor from fifty to eighty feet below the surrounding mesa, and varying in width from a few hundred feet to nearly half a mile, its walls for most of the course being too steep for cultivation and broken by many gullies running back into the level mesa land. The total length of the area described is about four and a half miles.

The hills at the upper end are of gray granite. About a mile below the hills, the arroyo cuts through a dike of crystallized calcite, and just above this dike are found outcroppings of magnetic iron ore and a good quality of marble. With the exception of the dike, the rocks of the arroyo consist of more or less decomposed granite, in places replaced by a hard pan composed of soil compacted by carbonate of lime.

The hills and the uncultivated parts of the mesa are naturally covered with a good growth of sage brush, but much of the watershed of the arroyo has been rendered bare and barren by repeated fires and the trampling of sheep. The mesa lands bordering the arroyo from the foot of the hills to the river bank are practically all in cultivation, either as grain fields or orange groves, and even parts of the steep walls are terraced and planted, leaving only here and there little patches of the original vegetation. In its lower course both sides of the arroyo are in the city of Riverside, and both bottom and sides are occupied by houses, gardens and pleasure grounds, Chinatown being a conspicuous feature of this portion.

For purposes of study I have divided the arroyo into three sections, the upper section being in the hills and watershed, the middle section containing the portion bounded by the cultivated mesa, and the lower section comprising the portion lying in the town and extending to the river.

In the following lists I will include only those plants actually collected or noted by the writer, and the lists given are rather intended to show the range and character of the flora than to be an absolutely complete census of its species, which might prove too extensive for a paper of this sort. Some of the plants noted occur in all of the course, but are listed in the section where they are most commonly found.

The plants of the upper section are such as are usually found among the rocky foothills of the region, and are typical of the Lower Sonoran Zone. The commonest species are as follows:

Dryopteris munita	Bromus Trinii
Cheilanthes Cooperi	Elymus condensatus
Gymnogramma triangularis	Elymus glaucus
Notholaena Newberryi	Epicampes rigens
Pellaea ornithopus	Polypogon monspeliensis
Pellaea andromedaefolia	Stipa coronata
Selaginella rupestris	Stipa setigera
Juniperus occidentalis	Stipa speciosa

Cyperus longispicatus
Scirpus macrocarpus
Allium hyalinum
Salix lasiolepis
Alnus rhombifolia
Chorizanthe californica
Pterostegia drymarioides
Calyptridium monandrum
Montia perfoliata
Delphinium Parryi
Platanus racemosus
Lupinus hirsutissimus
Lupinus rivularis
Trifolium tridentatum
Vicia americana
Oxalis Wrightii
Rhus diversiloba
Rhamnus crocea
Viola pedunculata
Zauschneria californica
Sphaerostigma strigulosa
Bowlesia septentrionalis
Dodecatheon Clevelandi
Ellisia chrysanthemifolia
Phacelia Whitlavia
Salvia mellifera
Antirrhinum Coulterianum
Castilleja foliolosa
Mimulus glutinosus
Pentstemon antirrhinoides
Pentstemon spectabilis
Scrophularia californica
Galium angustifolium
Baeria aristata
Baeria gracilis
Bebbia juncea
Brickellia californica
Carduus occidentalis
Chaenactis glabriuscula
Encelia californica
Ericameria Palmeri
Erigeron Nuttallii
Gnaphalium bicolor
Gnaphalium chilense
Layia platyglossa
Senecio californica

In the middle section a wider range of plant life is found than in either the upper or lower sections. This section lies between the foot of the hills and the Victoria bridge, a distance of two miles. Much of the floor of this section was originally covered with an almost impenetrable thicket of *Opuntia bernardina* and made a congenial home for the rattlesnake, the road runner and the coyote. Most of this land is now cleared and is gradually being turned into fields of grain, orchards, and forests of Eucalyptus. It is rather strange that in this section *Encelia farinosa* should completely replace *Encelia californica* which, is common enough in the upper section. In summer the floor and north side of this section is fiercely hot, and many species are found along the south walls in the partial shade that apparently can not endure the heat of the main floor and north wall of the

arroyo. Except for a very few common annuals and shrubs, the plants listed in this section are not found in either of the other sections.

Agrostis stolonifera
Avena barbata
Bromus hordeaceus
Bromus rubens
Bromus unioloides
Cenchrus tribuloides
Eragrostis major
Eragrostis pilosus
Festuca octoflora hirtella
Festuca reflexa
Lamarckia aurea
Muhlenbergia debilis
Hordeum murinum
Melica imperfecta
Melica imperfecta reflexa
Panicum crus-galli
Sitanion jubatum
Bloomeria aurea
Brodiaea capitata
Urtica urens
Eriogonum fasciculatum
Eriogonum gracile
Rumex hymenosepalus
Rumex crispus
Chenopodium album
Chenopodium californicum
Chenopodium murale
Atriplex bracteosa
Amaranthus retroflexus
Amaranthus albus
Mirabilis californica
Caulandrinium Menziesii
Portulaca oleracea
Silene antirrhinum
Papaver heterophylla
Eschscholtzia californica
Platystemon californicus
Brassica nigra
Brassica sinapistrum
Tropidocarpum gracile
Raphanus sativus
Sisymbrium canescens
Thysanocarpus curvipes
Dudleya laxa
Tillaea minima
Astragalus didymocarpus
Astragalus leucopsis
Lotus americanus
Lotus glaber
Lotus humistratus
Lotus strigosus
Lupinus densiflorus
Lupinus micranthus
Lupinus truncatus
Lupinus affinis
Medicago denticulata
Melilotus indica
Trifolium microcephalum
Trifolium neolagopus
Trifolium gracilentum
Erodium cicutarium
Croton californicus
Eremocarpus setigerus
Euphorbia albomarginata
Stillingia linearifolia
Malva parviflora
Malvastrum exile
Malvastrum fasciculatum

Mentzelia albicaulis
Opuntia bernardina
Opuntia basilaris ramosa
Opuntia Covillei
Sphaerostigma hirtellum
Sphaerostigma Veitchianum
Eulobus californicus
Godetia quadrivulnera
Daucus pusillus
Sanicula Menziesii
Anagallis arvensis
Philibertella Hartwegei hetero-
Convolvulus arvensis [phylla
Linanthus aureus
Linanthus dianthiflorus
Navarretia atractyloides
Gilia inconspicua
Gilia floccosa
Gilia virgata
Nemophila Menziesii
Phacelia distans
Phacelia ramosissima
Amsinckia spectabilis
Krynitzkia intermedia
Krynitzkia micrantha
Plagiobothrys Cooperi
Pectocarya linearis
Marrubium vulgare
Salvia californica
Salvia carduaceae
Salvia columbariae
Trichostema lanceolatum
Datura meteloides
Lycium Andersoni Wrightii
Nicotiana Bigelovii
Nicotiana glauca
Solanum Douglasii
Solanum Xanti glabrescens
Linaria canadensis
Mimulus brevipes
Orthocarpus purpurascens
Aphyllon californicus
Plantago patagonica
Galium aparine
Sambucus glauca
Cucurbita foetidissima
Cucurbita palmata
Echinocystis macrocarpa
Aplopappus ericoides
Artemisia californica
Artemisia heterophylla
Aster Menziesii
Aster exilis
Bidens pilosa
Bigelovia veneta
Corethrogyne filaginifolia
Encelia farinosa
Erigeron canadensis
Erigeron linifolius
Eriophyllum confertiflorum
E. confertiflorum latum
Filago californica
Gutierrezia Sarothrae
Helianthus annuus
Heterotheca grandiflora
Lepidospartum squamatum
Malacothrix californica
Psilocarphus globiferus
Sonchus asper
Senecio Douglasii
Stephanomeria exigua
Stephanomeria pleurocarpa
Stephanomeria virgata
Stylocline gnaphalioides
Xanthium canadense

The lower section of the arroyo extends from the Victoria bridge to its junction with the Santa Ana river, at which point the altitude is about 800 feet above sea level. The arroyo in this section is shallower and narrower than the middle section, and for a short distance is merged into the river valley proper. In this section, too, the original vegetation, where it has not been quite destroyed by cultivation, is being gradually replaced by a series of plants of alkali resisting character, owing to the seepage of water from the irrigated mesas collecting along the floor of the arroyo, rendering portions of it too marshy to cultivate, and the continual evaporation of this water leaves an ever increasing deposit of alkaline matter in the soil. The large percentage of introduced alkali resisting plants make an interesting feature of the list for this section of the arroyo.

Equisetum Funstoni
Typha latifolia
Andropogon halepensis
Agrostis stolonifera
Chaetochloa glauca
Distichlis spicata
Elymus glaucus
Lolium perenne
Lolium temulentum
Paspalum distichum
Panicum sanguinale
Polypogon littoralis
Sporobolus asperifolius
Cyperus esculentus
Cyperus inflexus
Cyperus laevigatus
Cyperus melanostachys
Eleocharis acicularis
Eleocharis capitata
Eleocharis palustris
Scirpus Olneyi
Scirpus lacustris occidentalis
Juncus bufonius
Juncus mexicanus
Juncus phaeocephalus
Sisyrinchium bellum
Anemopsis californica
Populus Fremontii
Salix lasiandra
Salix argophylla
Urtica holosericea
Phoradendron villosum
Eriogonum Thurberi
Polygonum aviculare
Polygonum lapathifolium
Atriplex semibaccata
Suaeda Torreyana
Suaeda minutiflora
Monolepis Nuttalliana
Nitrophila occidentalis
Salicornia subterminalis
Salsola tragus
Tissa marina
Clematis lasiantha
Ranunculus cymbalaria
Lepidium nitidum

Nasturtium curvisiliqum
Nasturtium officinale
Rosa californica
Lotus procumbens
Melilotus alba
Psoralea orbicularis
Trifolium Wormskjoldii
Vitis californica
Epilobium paniculatum
Oenothera Hookeri
Oenothera albicaulis
Oenothera californica
Apium graveolens
Foeniculum Foeniculum
Hydrocotyle ranunculoides
Hydrocotyle umbellata
Erythraea venusta
Eustoma exaltata
Asclepias mexicana
Convolvulus occidentalis
Cuscuta subinclusa
Emmenanthe penduliflora
Eriodictyon glutinosum
Heliotropium curassavicum
Verbena prostrata
Mentha canadensis
Stachys bullata
Petunia parviflora
Physalis ixocarpa
Solanum nigrum
Castilleja parviflora
Mimulus cardinalis
Mimulus grandis
Mimulus exilis
Veronica peregrina
Plantago lanceolata
Plantago major
Lobelia splendens
Nemacladus ramosissimus
Ambrosia psilostachya
Aster hesperius
Baccharis Douglasii
Baccharis Emoryi
Baccharis viminea
Bidens expansa
Centaurea melitensis
Franseria tenuifolia
Gnaphalium palustre
Helenium puberulum
Hemizonia pungens
Pluchea camphorata
Pluchea sericea
Lessingia glandulifera
Solidago occidentalis
Matricaria occidentalis
Xanthium spinosum

Between the mouth of the canyon and the channel of the river one finds the usual fringe of willow, alder and cottonwood, and in the swampy places are found the typical water plants of the region. At the present rate of change and improvement, and owing to the frequent fires that sweep the vegetation clean from the upper sections of the arroyo, the botanist will soon look in vain for many of the plants cited in the above lists, and at any rate this study may serve as a record for comparison with the flora of the future.

Riverside, California.

STUDIES IN TRIFOLIUM IV.

By P. Beveridge Kennedy

The group that we shall term the *latifolium* group is a segregate from that large section of perennial clovers found growing in the Rocky mountains region or west of it. They are essentially plants of mountain ranges and meadows, often entering into the composition of the wild or native hay. The published names that we shall consider in the group are:

T. Aitonii Rydb.
T. Covillei House
T. Haydeni Porter
T. latifolium (Hook.) Greene
T. longipes var. pygmeum Gray
T. longipes var. latifolium Hook.
T. orbiculatum Ken. & McDer.
T. oreganum Howell
T. multipedunculatum Kennedy
T. shastense House

Trifolium latifolium (Hook.) Greene, Pittonia **3:** 223. 1897.

T. longipes var. *latifolium* Hook. in Lond. Journ. Bot. **6:** 209. 1847.

T. Aitonii Rydb. Bull. Torr. Club, **34:** 46. 1907.

T. orbiculatum Kennedy & McDermott, Muhlenbergia **3:** 8. 1907.

The original plant, on which all the other species in the group are based, has never been adequately described. Hooker, at the place cited above, has

"Foliis majoribus fere late ovatis subrhomboidisve."

"Hab. Open pine-woods on the undulating ridge of Coeur d'Alene mountains; near St. Joseph's (n. 659) [Geyer].—In the variety the leaves are very broad, and the plant assumes much the character of T. repens: but the calyces are always hairy, and the segments much longer and narrower."

Greene, in Pittonia **3:** 223, gives the variety specific rank and says: "This plant, now abundantly represented in the herbaria, shows no traces of intergrading with *T. longipes*, from which its low stature, not at all elongated peduncles, its broad short leaflets, and distinctly pedicellate flowers all deflexed in age, thoroughly and specifically distinguish it."

We have not seen the original collection, n. 659 of Geyer, but we have several specimens which we consider typical. A

comparison of dissected floral parts of this material and of the type number material of *T. Aitonii* show them to be identical in structure. The plant looks like what we consider *latifolium* in every way, except that the flower heads are somewhat larger and the leaves considerably so. The fact that the plant called *T. Aitonii* comes from the same general region as the original *T. longipes* var. *latifolium* inclines us to the belief that *T. Aitonii* is a large form of *T. latifolium.*

Until we are able to see the original plant upon which Hooker based his var. *latifolium*, we shall consider Sandberg's plant from Kootenai county, Idaho, collected July, 1887, as typical, and describe it as follows:

A low creeping perennial plant, resembling very much the common white clover (*T. repens*) in habit and general aspect. There are about fifteen creamy white flowers, which become strongly reflexed in age, the pedicels also becoming gradually longer as the head matures.

Plant from 1 to 2 dm. high, not involucrate: stems ascending loosely and weakly from creeping rootstocks: stipules few, ovate-acuminate, about 10 mm. long, lobes entire: leaflets variable but all more or less rounded and mucronate at the apex, some ovate-rhomboid, glabrous above and slightly hairy beneath, about 2½ cm. long and 12 mm. wide, margins denticulate; petioles sparingly pubescent, those of the lower leaves about 6 cm. long: peduncles pubescent, 6 to 8 cm. long: heads terminal, 2cm. in diameter when young, becoming larger at maturity: flowers creamy white, completely reflexed in age by the deflexion of the pedicels, which are 3 mm. long and hairy: calyx densely pubescent, tube 2 mm. long, teeth 4 mm. long: vexillum 12 mm. long and 5.5 mm. wide, apex with a very small mucronate tip; blade of wings 7 mm. long and 2 mm. wide, rounded at the apex, auricled at base, claw of wings 4.5 mm. long; blade of keel oblong, 4 mm. long, 2 mm. wide with a blunt apex: pods strigose-hairy, two-seeded, seeds large.

Watson, in his Bibliographical Index of North American Botany, 264, is evidently mistaken in printing *T. longipes* var. *pygmeum* Gray, as a synonym of *T. longipes* var. *latifolium.* It

is more likely to be *T. Rusbyi*, as it comes from Bill Williams mountain, Arizona. The description in Ives Report 9. 1860, has nothing in common with *T. latifolium*.

When *T. orbiculatum* Kennedy & McDermott was described we were not aware of the variations of *T. latifolium*, especially at the different stages of growth. We distinguished *T. orbiculatum* from *T. latifolium* by the shape and texture of the leaves, but the variations are so great in this respect in the specimens we have on hand that we are now inclined to place very little weight on these characters. The length of the pedicels also depends very much upon the age of the flower. Until more specimens can be secured, we must consider *T. orbiculatum* a synonym of *T. latifolium*.

Specimens examined—

IDAHO

KOOTENAI COUNTY: Clarkia, *Elmer 1328;* in copses, *Sandberg*, July, 1887.

NEZ PERCES COUNTY: Lake Waha, *Heller 3273*.

Palouse country and about Lake Coeur d'Alene, *Aiton 65* (type of *T. Aitonii*).

MONTANA

Thompson Falls, *Blankinship 6* (type of *T. orbiculatum*).

OREGON

Canyons of the Wallowa, in shade, *Cusick 1363*.

WASHINGTON

SPOKANE COUNTY: Low grounds, *Suksdorf 918*.

Watson, in his Bibliographical Index to North American Botany, 264, printed the name "*T. longipes* var *brachypus*" but without reference to any description, making it a *nomen nudum*. Blankinship, in Montana Agr. Coll. Sci. Studies **1**: 81. 1905, described briefly a plant collected in alpine situations near melting snow, head of Cottonwood creek, Tobacco Root Range, 9000 feet, August 10, 1902, as "*Trifolium brachypus* (Wats.)" Blankinship. A careful examination of Blankinship's plant shows that it is a dwarf form of the yellowish flowered *T. Rydbergii*,

a common clover in Montana and Wyoming. Therefore *T. brachypus* Blankinship is a synonym of *T. Rydbergii*, which belongs to the *longipes* group.

TRIFOLIUM HAYDENI Porter, U. S. Geol. Surv. Montana, 480. 1872.

This plant is well described in the above report. All the specimens seem to come from Montana or from the adjoining region in Wyoming, and are all from high elevations, ranging from 8000 to 11000 feet. It can be distinguished from the others in the group by its calyx, which is glabrous. The teeth of the calyx are very short and about as long as the tube.

It is the only one of the group with a glabrous calyx, and in this respect resembles *T. Kingii* and *T. productum*. The habit of the plant, however, enables us to place it in the *latifolium* group.

Specimens examined—

MONTANA

Rock detritus, Lone Mountain, *Blankinship 125;* Mt. Bridger, Gallatin valley, *Jones 5770;* Mt. Bridger, Bozeman, *Blankinship 1;* Cook county, *Kelsey 7585;* Spanish Peaks, Madison Range, *Flodman 624;* Electric Peak, Yellowstone National Park, *Mearns 37*.

TRIFOLIUM MULTIPEDUNCULATUM Kennedy

This species was described and illustrated in the April number of Muhlenbergia. Two other collections by Cusick appear to be the same, but with longer calyx teeth. They are: Wallowa mountains near Aneroid Lake, 7000 feet, August 5, 1899, no. 2301, and in the Wallowa mountains in dry granitic soil, 8000 feet, August 15, 1908, no. 3320c.

We are aware that considerable variation occurs in this group, and that when opportunity for close field study presents itself, we may find the species as now considered so intergrading with one another that a revision of opinion may be necessary.

TRIFOLIUM OREGANUM Howell

The original description in Erythea **1**: 110. 1893, states that the ovary is glabrous. An examination of type number material by us shows plainly that the upper portion of the pod is strongly pubescent. The apiculation terminating the vexillum wings and keel is especially prominent in this species. In the wings it is almost 2 mm. long.

TRIFOLIUM SHASTENSE House, Bot. Gaz. **41**: 337. 1906.

We are of the opinion that *T. shastense* is a form of *T. oreganum.* An examination of several sheets of H. E. Brown's no. 365, mentioned as typical in the original description, shows no pubescence on the upper sides of the leaflets. The original description says "silky pubescent above and beneath." The vexillum appears more slender and the leaflets are narrower than in *T. oreganum.* More specimens and field studies in the region of the type are necessary before definite conclusions can be made in regard to the validity of the species.

TRIFOLIUM COVILLEI House, Bot. Gaz. **41**: 337. 1906.

We saw the plant referred to at the U. S. National Herbarium when Mr. House was working with the clovers, but we have no specimens like it, nor have we any duplicates of the type collection.

Nevada Agricultural Experiment Station.

NEW COMBINATIONS

Hesperonia limosa (A. Nelson) Standley

Mirabilis limosa A. Nelson, Bot. Gaz. **47**: 426. 1909.

Hesperonia glutinosa Standley, Cont. U. S. Nat. Herb. **12**: 365. 1909.

Mirabilis glutinosa A. Nelson, Proc. Biol. Soc. Wash. **17**: 92. 1904. Not Kuntze, 1898.

Hesperonia limosa retrorsa (Heller) Standley

Mirabilis retrorsa Heller, Muhlenbergia **2**: 193. 1906.

H. glutinosa retrorsa Standley, Cont. U. S. Nat. Herb. **12**: 365. 1909.

Hesperonia limosa gracilis Standley

H. glutinosa gracilis Standley, Cont. U. S. Nat. Herb. **12**: 365. 1909.

PAUL C. STANDLEY.

THE ALPINE SPRUCE

By A. A. Heller

Tsuga Mertensiana (Bong.) Carr. Trait Conif. ed. 2, 250. 1867.

Pinus Mertensiana Bong. Mem. Acad. St. Petersb. VI. **2**: 163. 1832.

Abies Pattoniana Jeffrey, Bot. Exped. Oregon, No. 4, 30. *pl. 4.* 1853.

Abies Williamsonii Newberry, Pac. R. R. Rep. **6**: 53. *pl. 7. f. 19.* 1857.

Tsuga Pattoniana Engelm. Bot. Cal. **2**: 121. 1880.

Hesperopeuce Pattoniana Lemmon, Third Bien. Rep. Cal. Bd. For. 126. 1890.

Only those hardy explorers of nature who wander afar among the elevated fastnesses of the Sierra Nevada and Cascade ranges will find this splendid tree with its graceful drooping fern-like branches, for it is found this far south only at high elevations.

Originally collected by Mertens on the island of Sitka, Alaska, while that Territory was still a Russian possession, it was long confused with a species much more common on the Pacific slope, namely, *Tsuga heterophylla* (Raf.) Sargent, a species inhabiting much lower regions, and more or less common in the coast region almost as far south as San Francisco. In the Third Biennial Report of the California State Board of Forestry, Mr. Lemmon writes concerning it as follows under the name of *Hesperopeuce Pattoniana:*

"This, the last of the Spruces to be described here, is a fine representative of strictly alpine arboreal vegetation, and hence limited to the upper points of forests that creep up along glacier beds and volcanic ravines, close to the perpetual ice.

"As but few of our mountains rise into this alpine region, so there are but few localities where these trees may be found fringing the upper edge of the coniferous forests, notably: around the snow cap of Mounts Ranier, Hood, Pitt, Scott, Shasta, Lassen, Sierra Buttes, Haskell's Peak, Webber Peak, Mounts Lola, Tallac, Silver Peak, Mounts Lyall and Whitney—in short, almost

every peak that rises to the region of perpetual snow in that long range called the Cascade in Washington and Oregon, and Sierra Nevada in California.

"Its northern limit in British Columbia is at an elevation of only eight thousand feet; on Mount Tacoma (Rainier), nine thousand feet; and on the slopes of Mount Hood, nine thousand; at Shasta, nine thousand two hundred; at Mount Lyall, nine thousand five hundred; and ten thousand feet near Mount Whitney, where it disappears.

"In many of these regions the lower part of the belt mingles with other trees, such as Red Silver Fir, Mountain Pine, or Aspen Poplar, and here the trees often attain a large size, six to twelve feet in diameter at base, tapering to a slender shaft, eighty to one hundred and fifty feet high; but in strictly alpine situations the trees are reduced to low conical masses of foliage or prostrate creeping shrubs.

"In favorable situations the lower limbs are retained and become long, out-reaching, and spreading over the mountain slope for many feet; the upper limbs are irregularly disposed, not whorled; they strike downward from the start (so that it is almost impossible to climb one of the trees for the want of foothold), then curving outward to the outline of the tree; they are terminated by short, hairy branchlets thst decline gracefully, and are decorated with pendent cones which are glaucous purple until maturity, then leather brown, with reflexed scales.

"The main stem sends out strong ascending shoots, the leading one terminating so slenderly as to bend from side to side with its many purple pendants before the wind, and shimmering in the sunlight with rare beauty.

"This Alpine Spruce, not strictly a Hemlock, was first discovered in 1852, by that sharp-eyed Scotch gardner, John Jeffrey, who was sent to this country by Edinburgh florists to collect seeds of forest trees in the wonderful region of the Northwest, but a few years before explored by David Douglas with rich results.

"This tree, with three other new species, rewarded the search of this explorer, and was described by Professor Balfour

and published anonymously in what was called the "Report of the Oregon Committee," under the name of "*Abies Pattoniana*," a name given to it by Jeffrey, in compliment to Mr. Patton, a botanist of the "Cairnies," in Scotland."

"The fruit or cone of the Alpine Western Spruce (*Hesperopeuce Pattoniana*) is oblong cylindrical, two to three inches long, purple until maturity, then light brown; scales becoming strongly reflexed at maturity, numerous, nearly all of the same size, broader than long, one half inch wide, striate, with a wavy or entire, thin, rounded edge; the bract on their backs closely clasped, small, three or four lines long, spatulate with an attenuate tip; seeds two lines long, angular, with resin vesicles on the upper side; wings large, elliptical, one fourth to one half inch long, one half as wide, thin and convex; leaves scattered, quadrangular (not in two ranks and flat as in the Hemlocks), linear, five to fifteen lines long, a half line wide, acute, strongly keeled above and below, narrowed to a slender petiole, which is promptly deciduous when withering, from the persistent leaf base; the latter less prominent, convex, and shining than the other species; male flowers very small, in clusters at the ends of the branchlets of the season, globular, three to four lines high, slightly raised out of the bud scales.

"A peculiarity of the Alpine Western Spruce is observed also in the Sub-Alpine or Mountain Pine (*Pinus monticola*), *i. e.*, the cone scales at maturity open out and turn firmly back, displaying their striated inner surface. The leaves, never in two ranks, are often so clustered as to recall the foliage of *Larix* (Larch), as do also the cones resemble those of that genus.

"It is not strictly a Hemlock in appearance or characters. It resembles the True Spruces and also the Larches, but is abundantly distinct from all. It is in fact as here classified—*sui generis*.

"This step is not taken thoughtlessly, but only after a careful study in the homes of this alpine inhabitant of the western peaks, as well as of its allies, and I think that no botanist acquainted with the Hemlocks of both the Old and the New World will, with this alpine tree before him, doubt that it has more

than a remote connection with that well known and very definite group of trees, the Hemlocks."

In the Manual of the Trees of North America, 52, Sargent writes as follows concerning the distribution of this species:

"Exposed ridges and slopes at high altitudes along the upper borders of the forest from southeastern Alaska, southward over the mountain ranges of British Columbia to the Olympic Mountains of Washington, and eastward to the western slopes of the Selkirk Mountains in the interior of southern British Columbia, northern Montana, northern Idaho, the Powder River Mountains, and along the Cascade Mountains of Washington and Oregon, on the mountain ranges of northern California, and along the Sierra Nevada to the canyon of the south fork of King's River, California; in Alaska occasionally descending to the sea-level, and toward the southern limits of its range often ascending to elevations of 10,000 feet."

The specimen that furnishes our illustration was taken from a tree growing at an elevation of 8000 feet some fifteen miles or more southwest of Reno on the trail to Mt. Rose. Here, at the lower limit of the tree's distribution, it is straight and handsome, growing as it does on a protected northerly slope. But farther up, on the slopes of Mt. Rose near timber line, which ranges from 9700 to 10000 feet according to exposure, while usually a tree of considerable size, it is no longer symmetrical. Buffeted by the fierce winter winds and snows, the branches on the west side of the tree are either entirely wanting or very short and gnarled, and the bark is commonly denuded. Unlike its associate, *Pinus albicaulis*, which is abundant as a prostrate shrub far above timber line, the spruce is rarely encountered above timber line at this place, but here and there a hardy individual may be found lurking among the pines. The greatest elevation at which it was noticed is 10500 feet.

After having observed the living tree, I quite agree with Mr. Lemmon that it should be considered generically distinct from *Tsuga*, the true Hemlock. There is nothing about the appearance of the tree or the mature cone that would lead one familiar with *Tsuga* to consider it as belonging to that genus.

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The Beard-tongue (*Pentstemon Davidsonii* Greene, and *Pentstemon geniculatus* Greene)

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MUHLENBERGIA

NOTES ON SOME INTRODUCED PLANTS OF SOUTHERN CALIFORNIA—I

By S. B. Parish

In the first and second volumes of Zoe (1890-91) I contributed a series of papers discussing, in some detail, the introduced flora of southern California. Eighteen years have elapsed since those papers were printed, a short period in the history of a plant population; yet within it have occurred instances of the rapid dissemination of some new-comers, as well as of the failures, partial or complete, of some weeds which are elsewhere very common, to have established themselves. In the present paper I shall confine myself to a consideration of certain cases of the character above indicated, and to a notice of a few plants of recent arrival.

An Invasion of Bromes

In one of the papers in Zoe I recorded the very recent introduction, on opposite sides of San Bernardino valley, of *Bromus rubens* and *B. maximus* var. *Gussoni*. These bromes were first noticed in the spring of 1888. In each instance there was but a small number of plants, which could have first appeared, at most, not more than two years earlier, and both owed their introduction to foul seed grain. Two years after they were first noticed, each species had spread for a mile along the roadsides of the two canyons in which they first appeared, and a few plants of one species were noticed in the valley itself. The diffusion of both bromes continued with increasing rapidity, and in a very few years large patches of either could be found in all parts of the valley and the surrounding hills. They are now among the most wide-spread, abundant and well established grasses of the

region. By roadsides and in waste places, in pastures and in cultivated fields, on dry mesas and hillsides, these pestiferous grasses abound. Both species are equally abundant, but they seldom grow intermixed, the one which first obtains a foothold appearing able to hold the ground against its companion, as well as against other vegetation. *B. rubens*, while attaining a more luxuriant growth in better soils, adapts itself also to those of the most sterile character. Dry and hard clay hillsides it coats with a close felt-like covering an inch or two high, that completely chokes out the native spring annuals that were their former occupants. On the other hand, neither species succeeds in permanently damp soil. Both are nearly valueless for forage, as animals will eat only the youngest growth, and both are injurious in hay, notably *B. maximus*, by reason of its greater height and long stiff awns. This species is locally known as "Broncho grass," and is believed to have here been introduced from Texas in seed oats, an erroneous opinion, since it is not known in that state. Both species have reached the borders of the deserts, being found sparingly at Palm Springs and near Hesperia.

In 1895 soft chess was observed growing in considerable quantity along the Southern Pacific railway as far east as Rochester, having been unknown in this region previous to that date. Its spread has been rapid, and it can now be found abundantly in waste places, pastures, cultivated grounds, and by roadsides throughout San Bernardino valley, but has not as yet made its appearance in the undisturbed soils of the mesas and hills. It has, perhaps, less adaptability to arid conditions than the previously mentioned species. It is also less objectionable than they, but has little or no forage value, although it has been recommended (**1**) for cultivation on thin sandy land where better grasses will not succeed. Our form of soft chess is mostly *Bromus hordeaceus* var. *intermedius* Shear, Bull Div. Agrost. U. S. Dept. Agr. **23**: 19. The species itself is rare.

Bromus hordeaceus is a native of Europe, now very widely distributed over the northern states of the Union, but apparently rarely abundant. I find no notice of its occurrence south of Virginia. It must be of comparatively recent introduction.

Wood's Botany (1866) notes it "in wheat-fields and waste grounds, rare," and Gray's Manual (5th ed., 1876) "in wheat fields, scarce." In 1882 Hollick and Britton report it as "not common" on Staten Island, New York (**2**); in 1890 it is a "recent addition" to the flora of Illinois (**3**); and in 1893 Dr. T. C. Porter characterizes it as a "fugitive, and very rare" in Pennsylvania (**4**). Even as late as 1896 Britton and Brown in their Illustrated Flora find it no more than "locally adventive," and in the present year (1908) the new edition of Gray's Manual characterizes it as "infrequent."

On the Pacific coast it is evidently more abundant, and it is found from Washington to Arizona. If, however, it was present in California at the time of the geological survey it escaped notice, as it does not appear in the botanical volumes (1880). Indeed the earliest mention I am able to find is in Dr. Davidson's "List of the plants of Los Angeles county" (undated, but published in 1892), where a record is made based on a specimen collected by Dr. Hasse at Santa Monica. In the next year he has seen a "few plants" at Pasadena and Los Angeles (**5**), and in his later "Catalogue" (1896) he notes it "on streets and in wastes, not common." But in that same year I saw it quite common in several places in San Diego county, as at Santa Ysabel and Oceanside.

Northern records are few and of recent date but indicate that this brome is well established and abundant. They are: Piper and Beattie, Fl. Palouse Region 29. 1900, "very common;" Jepson, Fl. W. Mid. Cal. 71. 1901, "very common;" Piper, Fl. State of Wash. (Cont. U. S. Nat. Herb. **11**: 144. 1906), "apparently wide spread." From the data now at hand it is not possible to determine with certainty in what part of the Pacific coast it made its first appearance, but it was probably in the north, whence it has worked its way southward—or there may have been more than one center of distribution.

Bromus maximus and its variety *Gussoni*, the latter the form exclusively represented in California, so far as is known, appear to be present in the United States, unless as doubtful waifs, only on the Pacific coast, where the variety is found

from Washington to Arizona. Beal, in Grasses N. Am. **2**: 611. 1896, has "Mich., H. E. Owen, Col., Cassidy." But floras of neither state, of later date, include it. See C. F. Wheeler, Cat. Mich. Pl. in Rept. Mich. Board Agr. (1898), and Rydberg, Fl. Colo. (1906). It was first collected "about 1862, by Bolander, near the Mission Dolores, in a field under cultivation" (**6**), and the same collector affords the only record in the Botany of the State Survey. Evidently it was of rare occurrence at that date in the region where it is now "one of the commonest grasses." (**6**) While it is so wide spread and apparently abundant on the western coast, there are but few printed notices of its occurence. Those I have been able to find are as follows: Davidson, Erythea **1**: 101. 1893; Pl. Los Angeles Co. 32. 1896; Bull. S. Cal. Acad. **6**: 11. 1907. "Rare and local in Los Angeles in 1893; has considerably increased in the original localities, and may be found in scattered patches in many parts of the country."—McClatchie, Erythea **2**: 78. 1894, reported from Santa Catalina Island; Fl. Passd. 629. 1895, "common below 2000 ft. alt."—Hansen, Fl. Sequoia gigantea Reg. 9. 1896.—Jepson, Fl. W. Mid. Cal. 71. 1901.—Howell, Fl. N. W. Am. 770. 1903.—Abrams, Fl. Los Ang. 54, 1904, "common along streets, and in waste places."—Piper, Fl. State Wash. 144. 1906, who alone reports the species, as well as the var. *Gussoni.* The references from southern California indicate an introduction probably little earlier than 1890, and a diffusion generally less rapid and extensive than has taken place about San Bernardino.

Bromus rubens is likewise closely confined to the Pacific coast, where it is found from Washington to southern California. Beal includes Kansas in its range (**7**), probably as a waif, for Shear (**8**) reports a single eastern specimen, "on wool-waste, at Boston."

On the western coast the record begins with Lemmon's collection in Plumas county, the only one noted in the Botany of the State Survey (1880), and probably the earliest made in North America. It appears to be less common in Washington and Oregon than in California. It is not mentioned in Piper and Beattie's Fl. Palouse Reg. (1901), and Piper quotes but a

single station in his Fl. State Wash. (1906). Howell, Fl. N. W. Am. 770. 1903, notes it indefinitely "in waste places," and Shear (**8**) had but one specimen from Oregon and none from further north. In this state it is abundant, as indicated by its representation in herbaria. Shear (**8**) cites specimens showing a range from Amador to Santa Ana, and Jepson's Flora two from the western middle counties. In the southern part of the state it has a history and records similar to those already given for *B. maximus:* Davidson, Erythea **1:** 101. 1893, "increasing rapidly; Pl. Los. Ang. Co. 32. 1896; Bull. S. Cal. Acad. **6:** 11. 1907.—McClatchie, Fl. Pasad. 629. 1895, "Devil's Gate."—Abrams, Fl. Los Ang. 54. 1904, "common in sandy soil."

In addition to the bromes already considered three others have been reported from our region. *B. madritensis* was found for the first time in North America in 1887 at Ft. Tejon, in Kern county. It was there and then well established, monopolizing a large tract of arid soil. Abrams (**9**) has since reported it from the Santa Ana mountains, on the San Diego trail, and according to Shear (**10**) it is rather widely distributed in California. In addition to the Ft. Tejon station he cites San Jose, Antioch, and Amador county, and according to Howell (**11**) it also is found in Oregon.

In 1905 a few clumps of *B. arenarius* were found on the Arrowhead road, in the San Bernardino mountains (**12**). Finally we have a single report of the occurrence of chess, *B. secalinus*, in southern California. It is noted as "rare" at Glendale, near Los Angeles (**13**). It seems remarkable that so common a species should not be frequently found in grain fields.

What may be the future of these now rare species cannot be predicted. Perhaps by the end of another period of twenty years, botanists may find them as abundant as are now those which twenty years ago were just beginning their career of conquest. And it will be cause of congratulation if they are not obliged to add some other of the worthless European bromes, such as *B. tectorum*, *B. sterilis*, *B. asper*, and *B. racemosus*, which are well established in various parts of the United States, and of which all but one have already appeared on the Pacific coast.

Other Grasses

Under the international rules of nomenclature the name *Setaria* must be restored in place of *Chaetochloa*, *Chamaeraphis* or *Ixophorus*, which have severally been proposed to replace it. Several old world species of this genus are common over a large part of North America, excepting the extreme north. A single one of these, *S. glauca*, has made its appearance in southern California. It has been collected at a number of places, as Los Angeles, San Bernardino, Rialto, and Riverside, so that it has had ample opportunities to establish itself. Apparently, however, while it may continue to grow for a number of years where it once appears, it lacks the ability of self diffusion. A marked instance occurred under my own observation. Over a ten-acre grain field this grass came up abundantly, evidently from very foul seed, and annually, for six or seven years, it continued to hold possession as an after-math. Then the field was over pastured for two or three years, resulting in the permanent disappearance of the *Setaria*. But in all the years it spread only to an adjoining roadside, where it still barely persists. A Mexican and Texan species, *S. gracilis*, has quite a wide roadside distribution in southern California, but apparently is never abundant, and certainly exhibits greater powers of persistence than of diffusion. The earliest collections were made at Los Angeles, but it has now appeared sparingly at San Bernardino. This is the grass reported as *S. caudata* by Davidson, Pl. Los Ang. Co. 31; Erythea **1**: 100, and as *Chaetochloa imberbis* by Abrams, Fl. Los Ang. 25.

Very rarely a few stools of timothy or orchard grass are found, but they seldom continue into the second year, and are to be considered as mere waifs. As neither grass is cultivated in this region the opportunities for the introduction of the seed are very few. *Cenchrus tribuloides* is well established and increasing about Colton and Rialto, and doubtless is destined to become a common and serious pest throughout the region. It is a grass which, when once it has taken root, can be gotten rid of only by the most persistent effort. Johnson grass (*Sorghum halepense*) is quite common by roadsides and in waste ground,

and in places in alfalfa fields and cultivated land, but can not be considered as particularly troublesome.

Lamarckia aurea is now one of our commonest grasses, and while of little economic value, is without especially objectionable characters, and has the recommendation of beauty.

Gastridium lendigerum, common in the coastal region, may have its range extended inland to San Bernardino, where a few plants were collected in 1907.

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(1) Scribn. Bull. Div. Agrost. U. S. Dept. Agr. **3**: 31.
(2) Bull. Torr. Bot. Club **9**: 157.
(3) Bull. Torr. Bot. Club **17**: 156.
(4) Bull. Torr. Bot. Club **20**: 206.
(5) Erythea **1**: 101. 1893.
(6) Jepson, Fl. W. Mid. Cal. 71. 1901.
(7) Beal, Grasses N. Am. **2**: 910. 1896.
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(9) Fl. Los Ang. 54. 1904.
(10) Bull. Div. Agrost. U. S. Dept. Agr. **23**: 26. 1900.
(11) Fl. N. W. Am. 770. 1903.
(12) Parish, Muhlenbergia **3**: 58. 1907.
(13) Davidson, Pl. Los Ang. Co. 32. 1896.

San Bernarc'ino, California

THE REAL ROSA WOODSII

By T. D. A. Cockerell

From time to time descriptions of imperfectly known plants have been reproduced in MUHLENBERGIA, to the advantage of western botanists not having access to the originals. I venture now to ask space for the original description of Lindley's *Rosa Woodsii*, a plant which has been much misunderstood by those who have not paid attention to the characters assigned in the first publication, in the Rosarum Monographia 21-22. 1820.

"R. stipulis sepalisque conniventibus, foliolis oblongis obtusis glabris. . A low shrub with upright, dull, dark branches, having very numerous, straight, slender, scattered *prickles*, with a few setae at their base, the former becoming stipulary towards the extremities; *branchlets* often unarmed. *Leaves* without pubescence; *stipules* very narrow and acute, convolute and fringed with glands; *stalks* armed with straight unequal prickles; *leaflets* 7-9, shaped like those of *R. rubella*, shining, flat, simply serrated, paler beneath. *Flowers* pink, appearing in the spring. *Fruit* naked, ovate, with short, connivent, entire *sepals* which are free from glands as is the peduncle. . . In character it approaches *R. carolina*, particularly in the remarkable convolution of stipulae. From this its numerous ramifications, weak prickles and short shining leaves sufficiently distinguish it. It moreover flowers in the spring and has naked fruit with conniving sepals. . . Said to be a native of the country near the Missouri."

In Rydberg's key in the Flora of Colorado, this would appear to run to *R. Macounii;* but that plant, as described by Greene, differs by its depressed-globose fruit, as well as other characters. Dr. E. C. Schneider (Distribution of Woody Plants in the Pike's Peak Region, 164. 1909), apparently following Professor A. Nelson *in litt.*, makes *R. Woodsii* include *R. aciculata* and *R. Macounii*. I believe that *R. aciculata* and *Macounii* are forms of a single species, and so stated to Dr. Rydberg some years ago. He did not agree, and I could produce no actual proof, and so the matter has rested. With regard to *R. Woodsii*, it seems necessary to find a plant really agreeing with the origional description. Such a plant has not come under my observation. (For notes on the discrepancies between the different descriptions, see Proc. Phila. Acad. 115. 1904.)

THE BEARD-TONGUE

By A. A. Heller

Pentstemon Davidsonii Greene, Pittonia **2**: 241. 1892.
and
Pentstemon geniculatus Greene, Pittonia **3**: 310. 1898.

Rarely is one so fortunate as to encounter two very distinct species of *Pentstemon* growing side by side, but such was the experience of Dr. Kennedy and myself on a recent trip to Mt. Rose, the highest peak in western Nevada, with an elevation of 10800 feet.

The larger flowered plant on the left is *P. Davidsonii*, with beautiful large lilac-purple flowers an inch or more in length clustered in few flowered heads. This species is common on Mt. Rose, ranging from 9500 feet in the gravelly and sandy granite of the forests of alpine white pine, to the very summit of the mountain in the shale and slate far above timber line, chiefly on northerly slopes, occurring in clumps of few individuals near the summit, but at the lower elevations often forming mats a foot or more in extent.

As described by Greene, it is "a low semiherbaceous creeping undershrub, the proper stem subterranean mainly and horizontal, rooting at the joints." And, as he furthermore remarks, "it is a very beautiful alpine dwarf, the flowers usually exceeding in size all the rest of the plant that is above ground." The type was collected on Mt. Conness near Mono Lake, California, "at an altitude of 12,300 feet, 15 Aug., 1890, by Mr. George Davidson." Other and more southern stations in California are "high mountains at the head of King's River," and "at 10,000 feet in Tuolumne County," reported by Mrs. Brandegee in Zoe **4**: 97. I can find no other records concerning the occurrence of this species in California or Nevada, but it should be found on other peaks about Lake Tahoe which have an elevation of 9000 feet and more. Piper, in Cont. U. S. Nat. Herb. **11**: 499, reports it from four localities in Washington, namely, Olympic mountains, Mt. Rainier, Mt. Adams, and from Loomis. I have not seen any of the specimens he cites.

Pentstemon geniculatus, the smaller flowered plant on the right, while of the same general habit, has entirely different characters. The leaves are ovate-lanceolate, acute, instead of rounded and obtuse, and the plant is more loosely branched. While the stem and leaves are smooth, the calyx and outside of the flower is clammy pubescent. The flowers are "in a single dense subcapitate terminal cluster which is twice as broad as high." The corolla is a half inch or more long, "of a dark lurid purple, narrow, slightly ventricose." In addition, it has a characteristic downward curve. The throat and upper part of the corolla is not at all constricted, but open, and in certain forms having but four lobes, is tubular.

Abnormal flowers are common in this species, the corolla divisions ranging in number from four to ten. One four-lobed flower had four stamens, all perfect; another had the stamens normal—four perfect, one sterile; still another had three perfect ones and one sterile. One with five divisions had three perfect stamens and two sterile ones. One with six regular divisions had five stamens, four perfect, one sterile. One with the lower lip four instead of three-lobed had normal stamens. A double flower had seven perfect stamens, three sterile ones, and two styles.

No definite type locality is given, only "common on alpine slopes, below retreating snow banks, in wet clayey or gravelly soil, in the Sierra Nevada of California." On Mt. Rose it ranges from 9600 to 10000 feet, and while not abundant at any one place, is found here and there, commonly in dense mats of a half foot to a foot in diameter Here it hardly occurs in wet places, but in gravel and sand. The ground is fairly moist, however, owing to the fact that the time between the disappearance of the snow and the flowering of the plant is comparatively short. The photograph was taken at an elevation of 9600 feet, in an open forest of *Pinus albicaulis*. It was also encountered a few days since (September 24th) at 10000 feet, growing on a bare northeasterly slope below one of the two permanent snow banks, the ground where it was found having been covered deep with snow when the photograph at the lower elevation was

taken on August 2d. So far it has been detected on Mt. Rose on the granite formation only.

The genus *Pentstemon*, with the exception of one species said to occur in northeastern Asia, is American, and confined chiefly to the region west of the Mississippi river. About two hundred and forty named forms have been recognized as occurring north of Mexico, and of this large number only thirty-nine according to the Cyclopedia of American Horticulture, have been introduced into cultivation.

Practically all of the species have showy flowers ranging in color from white to violet-blue, deep rose color and scarlet, and also exhibit quite a variety of structure, some of them having a long, almost cylindrical tube and short lobes, while others are more or less funnel-form with broad spreading lobes, and one small group has the narrow upper lip merely emarginate, the lower one pendulous and recurved. There is also great diversity in the make-up of the throat of the corolla, in some instances that part being channeled or pleated and partly closed, while again it may be open and unobstructed

The flowers have five stamens, hence the name of the genus, as opposed to the four stamens of related genera, but the fifth one is normally sterile. It is commonly spatulate in shape at the apex, and this is either naked or densely bearded on the lower side. In some species the fertile stamens are also bearded. The fertile stamens are unequal, two of them longer than the other two. The short ones are inserted at the base of the lower lip but free from it while the long ones are affixed to the tube for its whole length. The sterile filament is adnate to the upper lobe up to a point a little above the tube, when it abruptly curves inward. The characters concerning the stamen insertion are generic, at least for the species with more or less inflated corollas, and should be given a place in the generic description, but so far I have not found them mentioned in any of our floras.

The species of *Pentstemon* are mostly herbaceous perennials, but a few of them are decidedly woody at base, and several Californian ones, notably the crimson flowered *P. cordifolius*, have long vine-like branches.

NEW COMBINATIONS—I

By A. A. Heller

While preparing the manuscript for the third edition of the Catalog of North American Plants, it was found necessary to make a number of new combinations, due to changes in the delimitation of genera in most cases, and in a few instances new names had to be coined to replace homonyms. It was my intention to publish these in the Catalog itself, but since part of that work has already been distributed to subscribers with the changes appearing therein and the end of the volume not yet in sight, it is deemed best to publish them in this journal whenever space may permit.

Sabina flaccida (Schlecht.)
Juniperus flaccida Schlecht. Linnaea **12:** 495. 1838.

Sabina pachyphloea (Torr.)
Juniperus pachyphloea Torr. Pac. R. R. Rep. **4:** 142. 1857.

Merathrepta compressa (Austin)
Danthonia compressa Austin, Bull. Torr. Club, **3:** 21. 1872.

Merathrepta Parryi (Scribn.)
Danthonia Parryi Scribn. Bot. Gaz. **21:** 133. 1896.

Merathrepta sericea (Nutt.)
Danthonia sericea Nutt. Gen. **1:** 71. 1818.

Merathrepta thermale (Scribn.)
Danthonia thermale Scribn. Circ. U. S. Depart. Agric. Div. Agrost. **30:** 5. 1901.
Danthonia spicata pinetorum Piper, Erythea **7:** 103. 1899,
Merathrepta pinetorum Piper, Cont. U. S. Nat. Herb. **11:** 122. 1906.

Chloris Nashii
Chloris Texana Nash, Bull. Torr. Club, **25:** 441. 1898. Not *C. Texensis* Nash, Bull. Torr. Club **23:** 151. 1896.
Chloris ciliata var. *Texana* Vasey, Bull. U. S. Depart. Agric. Div. Bot. **12:** part 1, 30. 1890.

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ANNOUNCEMENT

A new edition of the Catalog of North American Plants is in preparation. Thus far 68 pages have been printed, and other parts will follow as fast as possible. In all there will be about 300 pages. Since a considerable time must elapse before the work can be completed, the 68 pages and other parts as soon as issued, will be sent to those who wish to have them in that form, for $1.25, payment to be sent with the order.

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539 West 5th street, Reno, Nevada

Volume 5 Number 9

MUHLENBERGIA

SEPTEMBER, 1909

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Mule Ears (*Wyethia mollis* Gray)

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MUHLENBERGIA

NOTES ON SOME INTRODUCED PLANTS OF SOUTHERN CALIFORNIA—II

By S. B. Parish

Prickly Lettuce

Lactuca Scariola L. var. *integrata* Gren. and Godr. Fl. France **2**: 230. 1850. Only this variety has been found on the Pacific coast, and it is the plant which has become so widely spread throughout the United States. It is distinguished by its spinulose toothed leaves. The species, which has runcinate or pinnately lobed leaves, is common only in the region about Cincinnati. The correct identification of these plants was first pointed out by Dewey, Rhodora **7**: 9-12. 1902. This is a striking example of the rapidity with which an introduced weed may overspread a continent. Its first appearance was in 1835, when a few plants were found near Cambridge, Mass., (**14**) and its early progress must have been slow, for thirteen years later, according to the 5th edition of Gray's Manual (1876), it was still known only from Cambridge, where it was "adventive; in waste grounds and by roadsides." By 1884, however, it was "becoming common in the Atlantic states, in waste grounds near towns and habitations," (**15**) and in the same year it appears in a list of recent additions to the flora of Richmond county, N. Y. (**16**). In the next decade it made a rapid conquest of the middle west, and the botanical journals contain frequent records of its appearance at places in those states. Usually it is reported as growing in some particular spot, along railways or roads, indicating that its introduction had been too recent for much diffusion. Thus

(**14**) L. H. Dewey, Bot. Gaz. **20**: 501. 1895.
(**15**) Gray, Syn. Fl. **1**: Part 2, 442.
(**16**) Hollick and Britton, Bull. Torr. Club, **13**: 83. 1884.

David F. Day had collected it "near the cattle-yards at East Buffalo; along the railroad tracks at Toledo, and by a roadside, 40 miles west of Milwaukee." (**17**) In a paper on "Recently introduced plants in and about Rockford, Ill.," M. S. Bebb states that "*Lactuca Scariola* was limited with us, for a few years, to a single patch on the embankment near the station house." (**18**) Aug. E. Foerste reports it as "quite abundant at Dayton, O.; already a pest at Put-in-bay; 3-5 specimens at Lincoln, Ill." (**19**) Other notices are: Cleveland, O., in 1882 (**20**); railway at Painsville, O. (**21**); Union county, Ind. (**22**).

Yet as late as 1889 it was still rare in places. In that year E. J. Hill reports: "I first noticed this plant in the summer of 1895, in the corner of an abandoned vegetable garden, and in the adjacent street, at Englewood, Ill. It has since spread along the street for a couple of blocks, and is well established. I have not seen it elsewhere in the vicinity of Chicago." (**23**)

Its westward progress still continued, and it soon reached Minnesota. Here, according to E. P. Sheldon, Minn. Bot. Studies **1**: 80, "the first plants were noted and collected in 1892, on the river bank, near the University, Minneapolis. During the summer of 1893 it spread so as to become a common weed in the neighborhood of Minneapolis and St. Paul." Notices of its appearance elsewhere in Minnesota may be found in *ib.* **1**: 409; **1**: 626; **2**: 192; **2**: 574. In Iowa in 1895 it was sufficiently common to be one of the "two common weeds" which supplied the subject for a paper by L. H. Pammel in Bull. 28, Iowa Agr. Exp. Station. It is also mentioned by Fitzpatrick, Fl. Iowa 100. 1899.

In the Rocky mountain states it appears to be less common. Only a single locality in each is reported from Montana

(**17**) Bot. Gaz. **8**: 159. 1883.
(**18**) Bot. Gaz. **7**: 136. 1882.
(**19**) Bot. Gaz. **7**: 69.
(**20**) Bot. Gaz. **8**: 159.
(**21**) Bot. Gaz. **8**: 203.
(**22**) Bot. Gaz. **11**: 219. 1886.
(**23**) Bot. Gaz. **13**: 153. 1889.

(**24**) and North Dakota (**25**), and it does not find a place in Rydberg's Flora of Colorado (1906).

Its advance southward appears to have been slow. In Millspaugh's Descriptive List of West Virginia Weeds (**26**) it does not have a place, but a year later he reports a single locality (**27**). About the same time Harper finds that "this weed seems to be obtaining a foothold in Georgia. I collected it in Athens, and saw it in Floyd and Whitfield counties. So far I have seen it only along railroad tracks." (**28**) Gattinger gives two locations in Kentucky (**29**). It is significantly absent from Mohr's exhaustive Plant Life of Alabama (**30**) and Coulter's Flora of Western Texas (**31**).

The first notice of the appearance of this weed on the Pacific coast was in 1891, when Mrs. Brandegee reported it as "becoming established," and as having been abundant the previous year on the grounds of the State University at Berkeley (**32**). Two years later it was "becoming common about Lake and upper Napa counties, and about the Sacramento river," (**33**) and at "landings and roadsides" on Bouldin Island (**34**). In all this region it is now very common (**35**). Its introduction into California, therefore, was not later than 1890, and probably but little earlier. There is nothing definite to indicate the date of its appearance northward, but ten years after it was first noticed in California it had a good foothold in Oregon and Washington, and was "becoming common." (**36**)

(**24**) Rydb. Fl. Mont. App. 484. 1900.
(**25**) Bolley and Waldron, Prelim. List Spermaphyta N. Dak. 639. 1900.
(**26**) Bull. W. Va. Agr. Ex. Sta. 23. 1901.
(**27**) *Ib.* **24**: 396. 1902.
(**28**) Bull. Torr. Club **28**: 484. 1901.
(**29**) Tenn. Fl. 161. 1901.
(**30**) Cont. U. S. Nat. Herb. **6**: 1901.
(**31**) *Ib.* **2**: 1892.
(**32**) Zoe **2**: 77. 1891.
(**33**) *Ib.* **4**: 154. 1893.
(**34**) *Ib.* **4**: 215.
(**35**) Jepson, Fl. W. Mid. Cal. 501. 1901.
(**36**) Howell, Fl. N. W. Am. 404. 1901; Piper and Beattie, Fl. Palouse Reg. 180. 1901.

In southern California it was first reported by McClatchie in 1895 from Pasadena (**37**), and in the same year I collected it along a street in San Bernardino, where its sparsity indicated that it had probably first appeared the previous year. In a recent interesting paper (**38**) Dr. A. Davidson relates finding, "in the autumn of 1896, two plants in Los Angeles," and that the same season Braunton had found it at Compton. Dr. Davidson regards it as now "the most troublesome weed in the district, and rivalling the mustard in luxuriance and density of growth." At San Bernardino it has spread all over the valley, in waste places and by roadsides, and in cultivated grounds and pastures, but not on the dry mesas and foothills. It does not here exhibit the extremely objectionable character attributed to it by Dr. Davidson. While widely disseminated I have never seen it growing densely, and seldom with luxuriance. The same remark applies to the black mustard (*Brassica nigra*), to which Dr. Davidson makes it a rival, and which is so dominating and rank about Los Angeles, while with us it is but occasional and produces little inconvenience. Evidently both weeds find more congenial ecological conditions near the coast than in the drier interior.

When the prickly lettuce became fully established in the prairie states it came to be recognized as the most aggressive pest with which the farmer had to contend. In some places it seemed that valuable farms would have to be abandoned because of it. But according to Dewey (**39**) the danger period has passed. It "has either found natural enemies which keep it in check, or for some reason it has lost much of its aggressive character. It is becoming much less abundant in regions where it formerly occupied nearly all the waste land and many of the cultivated fields, and the individual plants are generally less robust and less prolific than they were six to ten years ago."

(**37**) Fl. Pasad. 646.
(**38**) Bull. S. Cal. Acad. **6**: 17. 1907.
(**39**) Rhodora **7**: 10. 1905.

Some other Composites

There is little to indicate when the common dandelion (*Taraxacum officinale*) first appeared in California. The authors of the Botany of the State Survey (1876) were only able to say that there were "some indications" of its presence. Rattan reported it as common about Humboldt Bay in 1879 (**40**), and it was well established in the San Francisco region (**41**). Probably it is to be found at the present time in most parts of the state. In southern California it had already made its appearance at Los Angeles as early as 1892 (**42**), but was still rare three years later (**43**). It was in the latter year (1895) that I first saw a few plants in a lawn at San Bernardino. It is now frequent in that town and in the surrounding country, in lawns and by roadsides, and in damp meadows.

Twenty years ago the milk thistle (*Silybum Marianum*), although still infrequent, was increasing at a rate that threatened to make it a serious pest. The event, however, proved otherwise, and while it is now commoner it is for the most part confined to waste places and neglected roadsides. *Xanthium spinosum*, on the other hand, found in similar situations, is now much less frequent.

The Russian Thistle

No weed that has ever reached the United States, unless it be the Canada thistle, has excited more alarm, has proved more pernicious, or has provoked more warning bulletins and more repressive laws than has *Salsola Kali* var. *tenuifolia*, the miscalled "Russian thistle." Introduced about 1873, in flax seed brought from Russia, and sown near Scotland, South Dakota, (**44**) it spread with great rapidity, and proved a most serious pest, which is, indeed, its character in its native land, the steppes of southeastern Russia. The climatic conditions of that region

(**40**) California Hort. **9**: 333. 1879.
(**41**) Greene, Man. Bay Region 227. 1894.
(**42**) Davidson, List 10. 1892.
(**43**) Davidson, Pl. Los Ang. Co. 18. 1895; McClatchie, Fl. Pasad. 646. 1895.
(**44**) Dewey, Bull. Div. Bot. U. S. Dept. Agr. **15**: 12. 1894.

are not unlike those of our own Great Plains, and it is in that part of our country that this intruder has given the most trouble. While it has now spread quite generally over the whole United States, it has caused much less damage in other sections.

In carrying it from place to place, and thus establishing new centers of dispersion, the railways, especially by cattle cars, are thought to be the agents, as they are of the introduction of many other weeds. It was thus, very evidently, that the Russian thistle reached California. It first appeared at Lancaster, Los Angeles county, in Antelope Valley, a region presenting ecological conditions not altogether unlike those of Dakota. Although not brought to notice until 1895, when it had already spread to places ten miles distant in two directions, it was believed to have first appeared only four years before (**45**). While some efforts have been made to repress it, this weed has now become quite generally diffused throughout southern California. It has not, however, here proved so pestiferous a plant as was anticipated from the ill repute it has acquired elsewhere.

At San Bernardino I first observed it in 1901, in a stubble-field, where it had probably grown from foul seed grain. It is now to be found throughout the cultivated parts of the valley, mostly by roadsides and in waste places, and to some extent in grain fields. Even there it is not seriously injurious, as the grain is mostly cut for hay before the thistle has developed its rigidity. Indeed were it not for this objectionable quality it might serve as a forage plant, as it has a protein content of 17 per cent., indicating a good feeding value.

Some other Weeds

In recent years wild radish (*Raphanus sativus*) has become a very common weed in grain fields, often quite detrimental to the crop. *R. Raphanistrum* is just making its appearance, and is as yet rare. Dr. Davidson has observed it at Los Angeles (**46**), and a few plants have recently been seen at San Bernardino.

(**45**) Davidson, Erythea **3**: 158. 1895; Shinn, Univ. Cal. Agr. Ex. Station Bull. **107**: 10-13. 1895.

(**46**) Bull. S. Cal. Acad. **2**: 29. 1903.

The relative abundance or rarity of the two species seems to be the reverse here of what it is in the Atlantic states.

A noteworthy recent arrival is *Tribulus terrestris*. This was first noticed in 1903, growing along a railway bank at Port Los Angeles (**47**). During the present summer (1908), a few plants were collected near San Bernardino by Mr. W. G. Wright, and it was found in abundance in the Southern Pacific yards at Colton. The numerous prostrate stems attain a length of eight feet, producing at each short node a single fruit, which when ripe readily breaks up into five one-seeded indehiscent carpels, the edges of which are margined with prickles. With such efficient means for self dissemination it is probably destined to become common and troublesome. It is only within recent years that this European weed has made its appearance in the United States, but it has already been reported from widely separated localities. The most recent authority (**48**) reports it as occasional in the Atlantic States, and also from Illinois, Nebraska and Kansas.

Medicago lupulina, a very recent introduction, is rapidly becoming common in damp soils. *Melilotus alba* has become a frequent weed by roadsides and along fences. *Plantago lanceolata* has now become very common.

On the other hand, a few weeds which are very aggressive and wide-spread on the other side of the continent, have obtained a foothold here, have maintained it for a number of years, but eventually have disappeared. Of these is *Daucus Carota*, which in 1890 appeared in a suburb of San Bernardino. For a few years it slowly increased its area of occupation, but at lengrh ceased to reproduce itself.

Another such is *Datura Tatula*. In 1890 I made a note of the occurrence of this plant at San Bernardino (**49**), where it had there maintained itself, in a limited way, for twenty years and was then scattered over a few acres. For some ten years

(**47**) Davidson, Bull. S. Cal. Acad. **2**: 43.
(**48**) Gray's Man. 7th ed. 536. 1908.
(**49**) Zoe **1**: 123.

more it about held its own, when it began to rapidly diminish, and is now no longer to be found. A few plants have appeared sporadically at two other points, but have not reappeared in the second season. No effort was made to eradicate either of these plants, nor was there a change in the condition of the places in which they grew. It simply appeared that, triumphant as they have proved elsewhere, they here found themselves unsufficiently adapted to the environment to succeed in the struggle for existence.

San Bernardino, California

CERTAIN CALIFORNIAN THALICTRA

By Edward L. Greene

A subject of some earlier and much recent study on my part has been that *Thalictrum* aggregate which began to figure as a published species thirty years since under the name *T. polycarpum* (S. Wats. Proc. Am. Acad. **14:** 288. 1879). The original description is loose enough to cover a rather wide diversity of species, and accordingly within the thirty years that have passed a number of things notably different among themselves have been referred to it; this partly because of the insufficiency of Mr. Watson's diagnosis.

In 1892 (*Flora Franciscana*, 309) I was able, partly through what Mr. Watson had never attained to, a field knowledge of these plants, to effect a better definition and delimitation of the species, one element of it, as it then existed in herbaria, appearing as new, under the name *T. caesium*. More lately, having surveyed a very great amount of dried material labeled *T. polycarpum*, I perceive that at this date further segregation is necessary. It is also now apparent that the name *T. polycarpum* is untenable. It had been chosen to designate an Old World member of the genus twenty years before Mr. Watson attempted to employ it. Since, then, the Watsonian type must be named anew, I shall take this occasion to give it a fuller description.

Thalictrum ametrum

Stout, rather rigid, 3 to 5 feet high, the stem striate, purplish, glaucescent: cauline leaves sessile, compact, the leaflets overlapping one another, barely dark bluish-green above, glaucescent beneath, of rather firm texture; terminal leaflet usually broader than long, 3-lobed to the middle, the lobes acutely 3 to 5-toothed, lateral leaflets not very dissimilar, but smaller, less definitely 3-lobed: panicle of fertile plant rather contracted but large, often more than a foot long, naked except at base: sepals in male plant round-ovate, very obtuse, now and then truncate, and erose across the summit, thin-membranous and purple tinged, not obviously venulose; sepals of female plant truly ovate, at summit acutish, smaller, much more herbaceous, less purplish, not veiny: anthers short, only cuspidate-acute, or perhaps sometimes long pointed: fruit sessile, forming an exactly spherical head about ½ inch in diameter, each achene obliquely round-obovate, compressed, turgid, not ribbed, the sides marked by low sinuous veins running more or less obliquely and occasionally coming together to form meshes, the surface otherwise glabrous, glaucescent.

The range of *T. ametrum* was correctly given by me, under the name of *T. polycarpum*, in my *Manual* fourteen years ago, as that of the outer or true Coast Range; the completely distinct *T. caesium* occupying the foothills of the interior, either those of the inner Coast Range, or still farther eastward, and this as to middle California only, I am now constrained to say.

Thalictrum mendocinum sp. nov.

Evidently a yard or two in height, the stem stout, very erect, terete, faintly striate, as faintly glaucescent, beset with compact sessile leaves, and ending in an ample panicle: leaves of a dark livid green above, quite pale with bloom beneath; leaflets small for the plant, the terminal and lateral more than usually alike, longer than wide, narrowest at the obtuse base, mostly only 3-lobed and not deeply so, the lobes longer than broad, the median one mucronately acute: anthers long, softly aristate-pointed: fruit forming a spherical head less than ½ inch

thick (about 1 cm.), each achene sessile, obliquely somewhat rhombic-ovoid, compressed, the sides without ribs or even elevated veins, almost perfectly smooth, not turgid, faintly glaucescent,

The only specimens seen are from that large and isolated depression amid the mountains of the interior of Mendocino county that is known as Round Valley. They were gathered in the month of May, 1898, by Mr. V. K, Chesnut, and are preserved in the U. S. Herbarium on sheets 430474 and 430475. As unquestionably a member of the *T. ametrum* alliance it is distinguished from the type species and the rest by its smooth, almost veinless carpels. In view of this strong character I had wished to name it *T. leiocarpum;* but there is such a name, or at least synonym, already published.

Thalictrum magarum sp. nov.

Also allied to *T. ametrum*, as tall, more slender, the stem finely yet rather strongly striate, the whole plant very distinctly glaucescent, blackening in drying: cauline leaves all sessile, their leaflets in general cuneate-obovate, deeply as well as acutely and doubly lobed: head of fruit depressed-globose or somewhat so, the achenes being few and substipitate and those uppermost and central diverging from the center instead of standing erect; outline of achene subfalcate-ovate, its sides only few veined and faintly so, the veins tortuous merely, hardly sinuous, seldom or never running together to form meshes.

Inhabitant of mountains well towards the interior of San Diego county, California, collected in April, 1894, by R. D. Alderson; the special locality a place called Witch Creek. The type specimens are in my own herbarium, and I have seen no others.

Thalictrum latiusculum sp. nov.

Tall and very robust, glabrous throughout, the striate-angled stout stem glaucous, as also the fruit, the foliage much less so: leaflets dark bluish-green above, pale and glaucescent beneath, large, the terminals rather deeply 3-lobed, the laterals often similar, sometimes but lightly 2-3-lobed, or even almost

entire, all the lobes broad, abruptly acute: achenes among the largest, cuneately gibbous-obovate and very broadly so, 7-8 mm. long, 5 mm. wide above the middle, much flattened, glaucescent, variously subreticulate-veiny: seed large, oblong-ovoid.

Known only as collected on Mt. Sanhedrin, Lake county, California, 14 July, 1902, by Mr. Heller; also distributed by him under no. 5855, as "*Thalictrum caesium;*" but that species has achenes barely half as large, and white with bloom; not to name other good characters.

MULE EARS

By A. A. Heller

Wyethia mollis Gray, Proc. Am. Acad. **6**: 544. 1865.

So far I have not found the name "mule ears" applied to this plant in any of our books, but have heard it used locally, and a very appropriate name it is, for the large grey leaves look remarkably like the ears of a mule.

The plant was first collected near Carson City, Nevada, by Dr. C. L. Anderson, and it is not uncommon in our foothills and mountains leading up to the Sierra Nevada, often covering large areas in open, gravelly places. It is most abundant at elevations of from 6000 to 8000 feet. The roots are thick and woody, and the stem, from one to two feet high, bears several large leaves and one or more large yellow flowers, as shown in the illustration, which is from a photograph taken at Webber Lake, California, in July, 1901, by Professor S. B. Doten, of the Nevada Agricultural Experiment Station. The range of the species is given in the Synoptical Flora as "Sierra Nevada, especially on the eastern side, from Sierra Valley to Virginia City, Nevada, and westward to the Yosemite."

It is of considerable importance as a forage plant for sheep at least, as the writer can testify from personal observation. The following is taken from Bulletin **51**: 28, of the Nevada Agricultural Experiment Stafion:

"When a band of sheep comes to a patch of this sunflower the leaders rapidly eat off all the flowers; those following them pick out the young, tender leaves in the center of the plant, while those in the rear bite off the old leaves, eat the stem and then trample on the blade, leaving a very dejected-looking patch. Mr. Van Buren told us that during the month of August, when forage is not so abundant and some of the ranges are being grazed for the third or fourth time, sheep will eat a considerable quantity of the leaves. The herders also said that in the autumn when feed is scarce the sheep eat the dead dry leaves."

Wyethia commemorates the name of Nathaniel J. Wyeth, an enthusiastic explorer who twice crossed the continent be- [illegible] 32 and 1836 and made a determined effort to settle [illegible] the vast possibilities of that rich country. He indeed did not accomplish his purpose, but blazed the way for others. He built Fort Hall in southern Idaho while on his second expedition, and during the outward journey was accompanied by Thomas Nuttall, who previously, in Journ. Acad. Phila. 7: 38. 1834, described the genus *Wyethia* naming as the type *W. helianthoides*, which Wyeth had collected on his first journey on "the Kamas plains, near Flat-Head River, towards the sources of the Columbia and in the plains near the Blue Mountains of Oregon."

All told there are about fifteen species of *Wyethia*, nearly all of them natives of the Pacific slope, and at least seven of these confined to California. So far only two species have been found in Nevada *W. mollis* in the western part, and *W. amplexicaulis* from the middle part of the state eastward. One species, *W. lanceolata* Howell, is apparently local in the Blue mountains of Oregon. *W. arizonica* and *W. scabra* are found in the southern Rocky mountains, while *W. amplexicaulis* and *W. helianthoides* are of the northern Rocky mountains and the Great Basin.

There is no reference to *Wyethia* in the National Standard Dispensatory, so the plant is apparently not used medicinally, but Gray in the Synoptical Flora says the "thick roots and seeds were food of the Indians."

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ANNOUNCEMENT

A new edition of the Catalog of North American Plants is in preparation. Thus far 68 pages have been printed, and other parts will follow as fast as possible. In all there will be about 300 pages. Since a considerable time must elapse before the work can be completed, the 68 pages and other parts as soon as issued, will be sent to those who wish to have them in that form, for $1.25, payment to be sent with the order.

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A. A. Heller,

539 West 5th street, Reno, Nevada

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Editors: A. A. HELLER and P. BEVERIDGE KENNEDY

Lupinus pusillus Pursh. The small Nevada form

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University of Nevada,
Reno, Nevada

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MUHLENBERGIA

THE NEVADA LUPINES—I

By A. A. Heller

The only connected account of the Nevada members of this interesting genus is that by Watson in the Botany of the King Report 53-58. 1871. He enumerated seventeen different forms as occurring in Nevada, four of which were described as new species and one as a new variety. One was designated as an unnamed species from the East Humboldt mountains, and one as an unnamed variety. Some of the names used by him clearly do not belong to any of our Nevada plants, but these will be mentioned in their proper places during the course of this study.

Since 1871 three Nevadan species have been described, *L. Shockleyi* Wats., *L. malacophyllus* Greene, and *L. micensis* Jones, and two others appear in this paper.

All three of the sections treated by Watson in Proc. Am. Acad. **8**: 517-548. 1873, are represented in Nevada, as are also the minor groups.

Only the sections Lupinellus and Platycarpos will be treated in this first paper. It seems best to me to study the annuals first and arrange them all in sequence, rather than divide them as Watson did. *L. micensis* Jones is excluded from this paper, since it proves to be not a member of the Platycarpos group.

A number of years experience in the field has convinced me that the principal characters are to be found in the flowers and calyx. True, there are often important characters in the pods and seeds, but a fruiting specimen alone is very hard to determine unless one has a very good idea of what it ought to be. In certain groups the seeds of a number of species appear to be practically the same in shape and coloring, but the pods are more apt to vary in the kind and degree of pubescence.

The genus has been considered a difficult one, but as a whole there is much less individual variation than in some other genera. The trouble has been here as elsewhere, that descriptions are imperfect, some of the most important characters being left out, and the descriptions are not uniform, even by the same author, so that it is impossible to compare the parts of one species with the same parts of another species.

Even when the descriptions are fairly good and complete, there has been a most unaccountable jumbling of totally different things under one name. *L. brevicaulis*, for instance, is a species that has been much misunderstood. Watson himself apparently confused several distinct species, but his description and the illustration of the floral parts clearly point to one well marked form. One finds all sorts of things under this name, from the nearly glabrous large violet flowered *L. odoratus* with well developed green calyx lobes and rather fleshy leaves, to *L. malacophyllus* with verticillate large white flowers and copious soft pubescence. There is absolutely no excuse for such laxity, except that we get into the habit of naming things by comparing them with other specimens which may or may not be rightly determined, instead of going to the original.

During the course of these studies I shall endeavor to see the types of all the species. The descriptions will be made uniform, and the floral parts at least of each species will be illustrated. The shape of the banner in the living plant is usually very characteristic, but as that organ is difficult to draw, especially in those species that have the edges turned back and the face strongly grooved, no attempt will be made to figure it in most cases.

The genus is of considerable economic importance on account of its value as a forage plant for all kinds of animals, but the seeds are known to be poisonous to stock. Very little has been done in the way of studying this poison and its properties in connection with our American species; whether it is equally present in all species or only in certain ones to any extent. Before the study of the genus is completed I hope to be able to make some definite statement on this point.

My thanks are due to the following gentlemen, who have generously granted me the privilege of examining certain species of the section Platycarpos: Dr. E. L. Greene; Mr. S. B. Parish; Dr. J. N. Rose, of the U. S. National Museum; Dr. Wm. Trelease, of the Missouri Botanical Garden; Professor Aven Nelson, of the University of Wyoming; Professor L. R. Abrams, of Stanford University, and Dr. H. M. Hall, of the University of California.

LUPINELLUS

Annual: flowers axillary, solitary, keel nearly straight: pods ovate, 2-seeded.

LUPINUS UNCIALIS Wats. Bot. King Rep. 54. *pl.* 7. *f.* 5-10. 1871.

"Annual, dwarf, villous, diffusely branched, leafy; leaflets 5, oblong-spatulate, obtuse; flowers small, axillary, solitary; the peduncles equaling the leaves or shorter; legumes 2-seeded.—Very small, but 1 inch high; leaves on ¼-½ inch petioles, leaflets 2 lines long; stipules adnate, obtuse; bracts short, oval; the upper lip of the calyx deeply 2-cleft, the lower larger, 3-toothed, the middle tooth small; vexillum obovate, shorter than the wings and keel, the sides scarcely at all reflexed; wings free or but slightly united; keel rather obtuse; flowers ochroleucous, the keel tipped with purple. Found on the dry foot-hills of the Truckee and Pah-Ute Ranges, Western Nevada; 5,000 feet altitude; May, June. Plate VII. Fig. 5. An entire plant; twice the natural size. Fig. 6. A flower. Fig. 7. Calyx opened out. Fig. 8. The petals. Fig. 9. The stamineal column, opened. Fig. 10. Ovary; all enlarged four diameters. (224.)"

To the best of my knowledge this species has never been found since Watson collected it in 1868. It is evidently a plant of rather restricted range, as indeed are many of the lupine species, and that it has not been encountered again is probably due to the fact that no botanist has visited the region where it was originally collected. In the Botany of California the type locality is more definitely stated as "on rocky hillsides near the Big Bend of the Truckee in Northwestern Nevada."

PLATYCARPOS

Annuals, often with decumbent branches from the base: cotyledons not petioled, broad and clasping, usually persistent: petioles with a membranous, stipular dilated, strongly 3-nerved base, the stipules proper lanceolate or subulate, usually situated near the summit of the dilated part: flowers either scattered or verticillate; keel glabrous, moderately curved dorsally, almost straight along the inner edges: pods ovate, about 1 cm. long, usually 2-seeded.

Flowers in terminal racemes, sides of the banner more or less reflexed	
Racemes equalling or shorter than the leaves	
Flowers blue or purple, little exceeding the nearly equal calyx lobes	L. Shockleyi
Flowers violet, fading pale	
Upper calyx lobe 2-parted, lower entire, much shorter than the flowers	L. pusillus
Upper calyx lobe 2-divided, with a broad sinus, the lower 2-toothed	L. dispersus
Flowers violet even in age	
Upper calyx lobe obsolete, represented by a bractlet at the sinus, lower entire, nearly as long as the flower	L. brevicaulis
Racemes commonly overtopping the leaves	
Flowers verticillate, at least below	
Flowers white or purple tinged; upper calyx lobe scarious, notched, lower green, much longer, 3-toothed	L. malacophyllus
Flowers not verticillate	
Flowers deep violet-purple; banner with a yellow spot	
Calyx pubescent, the upper lobe green, 2-parted, lower twice as long, 2-toothed	L. flavoculatus
Calyx glabrous, the upper lobe green, entire, lower twice as long, entire or slightly 3-toothed	L. odoratus

LUPINUS SHOCKLEYI Wats. Proc. Am. Acad. **22**: 470. 1887.

Nearly acaulescent, 5 to 10 cm. high with a spread twice as wide, the lowermost petioles and peduncles horizontal or nearly so, densely silky villous throughout except the upper surface of the leaves, the hairs more spreading on the petioles, peduncles and pedicels: petiole three or four times longer than the blade; leaflets 9 to 12, rather thick, broadly spatulate or oblanceolate, about 8 mm. long, 3 or 4 mm. wide, glabrous above: peduncles

2cm. long or less, the raceme equal to or a little longer than the peduncle, the whole barely as long as the leaves: pedicels 2 mm. long: bracts subulate, membranous, a little shorter than the pedicel: flowers not verticillate, probably violet-blue, said to be "blue or purple:" calyx with nearly equal lobes, the upper 3mm. long, 2-cleft into lanceolate bearded divisions, the lower 4 mm. long, minutely 3-toothed, the teeth obscured by the long hairs; the sinus bractless: banner probably little if at all reflexed, broadly ovate when spread out, 5 mm. long, 4 mm. deep; wings moderately inflated, about 3 mm. wide, well rounded on the dorsal edge; keel blunt and rounded; pods about 12 mm. long, 7 or 8 mm. wide, papillose, villous only on the margins, 2-seeded: the seeds large, about 4 mm. across.

According to Watson the type was collected "near Soda Spring, Candelaria County, Nevada (*W. H. Shockley*, May, 1886)." A later collection by Shockley (no. 367) is labeled "Sodaville, April and June, 1888, in open sand." Soda Spring and Sodaville are no doubt one and the same place. These two collections by Shockley are the only known ones from Nevada.

Watson also cites specimens from "the Mohave Desert, San Bernardino County, California (*Parish Brothers*, May, 1882)." But the specimens in Mr. Parish's herbarium from the Mojave desert appear to have much larger flowers than the Nevadan type. However, he has a specimen that is more nearly typical. It is no. 96, collected on the "borders of the Colorado Desert, Whitewater, San Diego Co., April, 1882." The plant is of the same habit as the type and pubescent like it, but the lower calyx lobe is 2-cleft like the upper one instead of merely minutely 3-toothed. Field study may prove these plants to be distinct.

LUPINUS PUSILLUS Pursh, Fl. Am. Sept. **2**: 468. 1814.

Since this species is but scantily represented in Nevada and our specimens but doubtfully referred to it at first, I took occasion to look up all the available literature concerning it. The type is apparently in England in the Lambert Herbarium. Pursh described it as follows:

pusillus. 5. L. biennis, pusillus, undique pilis albidis hirsutissimus; foliis digitatis: foliolis (7) lineari-ellipticis supra glabris, calycibus alternis inappendiculatis: labio superiore bipartito; inferiore integro, leguminibus sub-dispermis.

On the banks of the Missouri. [Biennial sign.] June. *v. s. in Herb. Lewis.* Flowers small, a fine blue mixed with red.

The next mention of the plant is by Nuttall, Gen. **2**: 93. 1818. His description is somewhat fuller and differs a little: "Annual, small and very hairy; leaves digitate, leaflets (5 to 7) cuneate-oblong, above smooth and somewhat glaucous; flowers alternate, calix inappendiculate, upper lip short and bidentate, lower ovate-lanceolate, entire; legume 2-seeded, hirsute. HAB. On the barren argillaceous plains of the Missouri, near the confluence of White River. OBS. From 4 to 6 inches high, growing in considerable quantities together; flowers bright blue, appearing in May; bractes nearly as long as the calix, the lower lip of which is twice the length of the upper; wings of the corolla adnate at the summit; carina resupinate, attenuated; stamina united into a cylinder, anthers alternately minute; style smooth, rigidly persistent; legume extremely pilose-hirsute."

Hooker, Fl. Bor. Am. **1**: 163. 1830, records it from "the barren grounds of the Columbia. *Douglas.* This is a very singular species, with short, sessile, many-flowered racemes. The membrane of the filaments is very large, five of the stamens are elongated and barren, five shorter with linear orange-colored anthers. Legumes about an inch long, each with two flat seeds."

Agardh, Syn. Gen. Lup. 15. 1835, has evidently taken his description from Douglas' specimen "ad confluentes rivulos Columbiae et "Levis Clarkes river" lectum, vidi in Hb. Lindl." He described it as much branched from the base, the basal branches horizontal. The flowers are said to be few and remote, the bracts sub-obovate, equalling the calyx tube, and the lower calyx lobe sub-3-dentate, the middle tooth longer.

Eaton, Manual ed. 7, 380. 1836, makes the surprising statement "banner 2-parted," a character not yet observed in any species of lupine, so far as I am aware.

Torrey and Gray, Fl. N. A. **1**: 374. 1840, placed it not in what was afterward designated the Platycarpos section, but in Lupinus proper, with the cotyledons petioled after germination. They described the calyx as having "the upper lip 2-cleft, shorter than the obscurely 3-toothed lower one." They also say "raceme scarcely longer than the leaves, 8-12-flowered. Corolla bright blue," and the leaflets are "obtuse, narrowed at the base." They had examined specimens from "barren argillaceous plains of the Missouri," collected by Lewis, Nuttall, and Dr. James, thereby indicating that they had seen the type material collected by Lewis.

Watson, Proc. Am. Acad. **8**: 539. 1873, adds the new character "bractlets minute," and says the leaflets are "acute or obtuse," the first definite mention that they are other than obtuse. In Britton and Brown, Illustrated Flora **2**: 270. 1897, they are also given as "obtuse or acute at the apex," and the figure represents them as acute.

The following description is drawn from my no. 9599, collected at Wadsworth, Churchhill county, May 7, 1909:

About 1 dm. high, with an equal spread, or sometimes one and a half times the height, caulescent, the stem proper about 2 cm. long, the branches at first ascending, finally spreading, whole plant except the upper surface of the leaflets hirsute with spreading white hairs: petioles two or three times the length of the blade, with a prominent yellow midrib; leaflets usually 5, oblanceolate-oblong, rounded at the apex, 2 cm. or less in length, up to 7 mm. wide, appressed hirsute beneath, glabrous above, margins ciltate: peduncles very short, rarely as much as 1 cm. long, the inflorescence up to 4 or 5 cm., but the whole shorter than the leaves: flowers bright violet-blue fading white or pinkish, 6 mm. long, 5 mm. deep, distance between apices of banner and wings about 2 mm.: bracts membranous, oblong-lanceofate, 5 mm. long, over 1 mm. wide at base, bearded with long hirsute hairs: pedicel barely 2 mm. long, glabrous: calyx tube nearly

glabrous; lobes green, hirsute like the rest of the plant, the upper about 1.5 mm. long, cleft to the base into lanceolate divisions, lower 3 mm. long, entire: banner with the edges turned back, appearing as if shorter than the wings, when spread out 6 mm. long, 5 mm. wide; wings moderately inflated, open and exposing the keel to a point a little above the lower calyx lobe: keel moderately curved dorsally.

I have not been able to definitely locate the place where Lewis collected the type, but the date was June, 1804, and Nuttall's "plains of the Missouri, near the confluence of White river," is probably not far from the original locality. The White river empties into the Missouri in southern South Dakota.

Numerous specimens from Wyoming, Nebraska and South Dakota differ from the Nevada plant in being stouter, more branching, with more numerous racemes and larger flowers, the shape of the parts being the same. So far I have seen no plants with acute leaflets. Frequently they are doubled so that only the lower surface is exposed, and this half of a leaflet may be responsible for the statement by some writers that they are acute.

In the middle of sheet 20947 in the U. S. National Herbarium is a plant of our small flowered Nevada form of *L. pusillus* collected by Watson in "Unionville Vall. June, 1868." To the right of it is an entirely different plant but apparently included under Watson's label. The latter seems to be *L. rubens* Rydb. On the left hand side of the same sheet is a somewhat smoother plant, collected by Captain Bishop in southern Utah in 1872, and marked *L. rubens* by Rydberg. Whether the *rubens* plant under Watson's label really belongs there or should go with Bishop's specimen I do not know. Owing to the dubious status of this specimen I shall make no further mention of it at present. The following specimens from Nevada of *L. pusillus* have been examined:

CHURCHHILL COUNTY: Wadsworth, *Heller 9599*.
ESMERALDA COUNTY: Candelaria, *Shockley 270*.
HUMBOLDT COUNTY: Unionville valley, *Watson 221* in part.

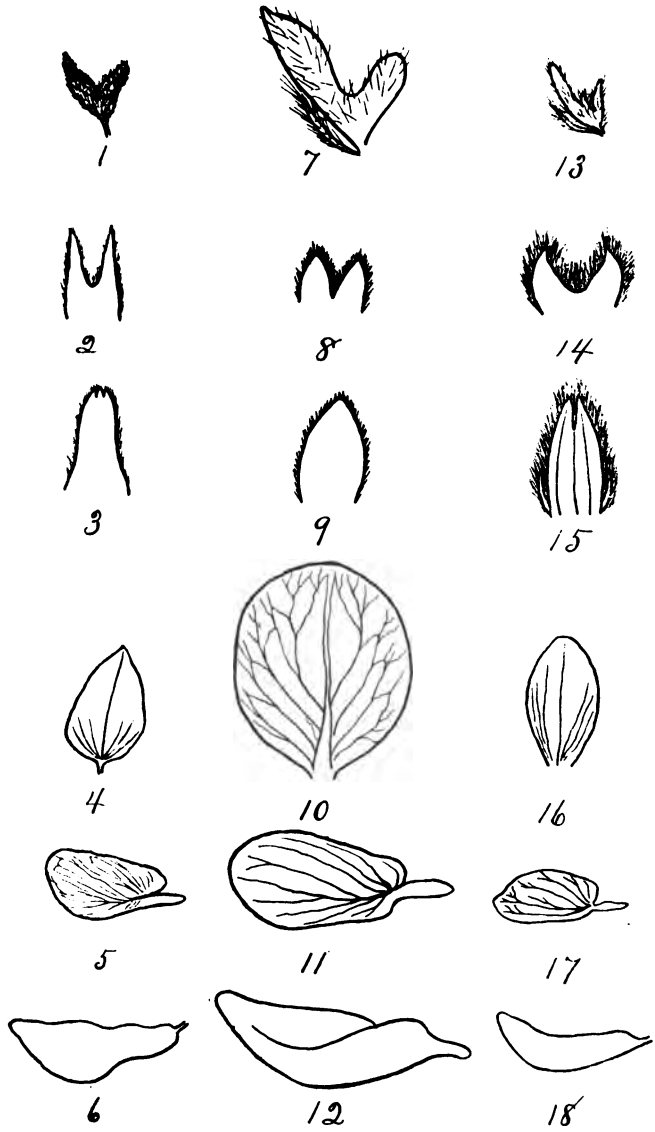
Lupinus dispersus

Annual (section Platycarpos), nearly acaulescent, depressed or prostrate, only the early petioles and peduncles erect, the plant with a spread of 3 to 10 cm., densely white villous throughout except the glabrous upper surface of the leaflets: petioles often purple, up to 3 cm. long; stipules green, somewhat ascending, 4 or 5 mm. long in larger plants: leaflets 7 or 8, oblanceolate, rounded and obtuse at the apex, 1 cm. long, 4 mm. wide at the top: peduncles and inflorescence rarely equalling the leaves, the former only a little longer than the short and dense racemes: bracts linear-lanceolate, purplish, about 3 mm. long: pedicels very short and stout, barely 1 mm. long: upper calyx lobe less than 2 mm. long, 2-parted almost to the base, the divisions with a broad somewhat U-shaped sinus; lower lobe nearly 4mm. long, prominently 2-toothed, the sinus narrow; the lobes with a bractlet in each sinus; flowers violet blue when fresh, fading yellowish, 6 mm. long, about 4 mm. deep; banner with the edges reflexed in the upper half only, the face grooved, oblong-ovate when spread out, 4 mm. wide; wings moderately inflated, nearly oblong, 2 mm. wide, slightly obliquely rounded below the apex; keel moderately curved dorsally from elbow to apex, the inner edges nearly straight: pods ovate, 1 cm. long, 6 mm. wide, more or less white-villous, 2-seeded, the seeds somewhat lenticular in shape, 2 mm. across, whitish, smooth.

The type, deposited in the herbarium of the Nevada Agricultural Experiment Station, is my no. 9643, collected May 17, 1909, at Rhyolite, Nye county, Nevada, at the northeastern base of Ladd mountain growing in sand, elevation 3575 feet. It is apparently scarce there, as only a few plants were found. The species is evidently related to *L. brevicaulis*. It is distinguished by the very characteristic calyx, with the green upper lobe parted to the base and the sinus broad. The upper calyx lobe is so obscured by the dense white pubescence that a hasty glance will not reveal its true shape.

Besides the type only one other specimen from Nevada has been examined. It is *Goodding 942* in part, collected in Meadow Valley Wash at Caliente, Lincoln county, mixed on sheet

Muhlenbergia, Volume 5 Plate 3



Lupinus Shockleyi: 1. Calyx; 2. upper calyx lobe; 3. lower calyx lobe; 4. banner, 5. wing; 6. keel.

Lupinus pusillus: 7. Calyx; 8 upper calyx lobe; 9. lower calyx lobe; 10. banner; 11. wing; 12. keel.

Lupinus dispersus: 13. Calyx; 14. upper calyx lobe; 15. lower calyx lobe; 16. banner; 17. wing; 18. keel.

41536 in the Rocky Mountain Herbarium with *L. flavoculatus*, distributed under no. 942 as *L. brevicaulis*.

Four collections from Colorado have come to hand. The first is *C. F. Baker 437*, collected at Arboles, June, 1899, distributed as *L. brevicaulis* and listed as such by Rydberg in the Flora of Colorado. The second is by *C. S. Crandall*, collected in the vicinity of Durango, June 26-27, 1898, distributed as *L. Kingii*. I can find no record of this in the Flora of Colorado. The third is *Osterhout*, Glenwood Springs, June 17, 1899, in part. This is the type collection of *L. scaposus* Rydb. Bull. Torr. Club **34**: 45. 1907. But on sheet 16950 in the Rocky Mountain Herbarium there is one plant of *L. scaposus*, and another that is plainly *L. dispersus*. The fourth is *Purpus 175*, collected May, 1892, at Surface Creek, and it also is not listed in the Flora of Colorado. It was apparently distributed without specific name, but sheet 128176 in the herbarium of the University of California (Brandegee Herbarium) has "*micensis* Jones" written in. This specimen is less compact than any of the others, and the peduncles on two plants slightly exceed the leaves.

From New Mexico we have a specimen collected by *Wooton*, May 28, 1905, in the Organ mountains, Dona Ana county. Some of these plants are large, having a spread of 2 dm. It was apparently distributed as *L. Sileri*. There is another collection from the same place by the same collector, April 30, 1893, distributed as *L. Kingii*.

Jones 5273, collected at Kanab, Utah, May 22, 1894, is also this species. It was distributed from the U. S. National Herbarium as *Lupinus brevicaulis*. One plant, apparently abnormal, shows greatly elongated peduncles which were prostrate when growing.

A specimen collected by *Norman C. Wilson* near Kingman, Arizona, June, 1893, is also referred here. It is sheet 126959 in the herbarium of the University of California.

There is a specimen of this species in the herbarium of Dr. Greene labeled *L. brevicaulis*, collected by *Lemmon* in "N. E. Cal. and Nevada." Since all of the other specimens are from the southern part of the country, it is just possible that this was collected in Arizona. It is one of the largest plants seen, having a spread of 2 dm.

FERNS OF PARADISE PARK

By A. S. Foster

The following is a transcript of the collector's notes of the ferns collected in the Mt. Rainier National Park, Washington, August 3-12, 1909:

1. Polypodium hesperium Maxon. On the face of a cliff by the roadside, northern exposure, altitude 4000 feet(?). Rare.

2. Phegopteris Dryopteris (L.) Fee. In humus on the trail opposite Narada Falls. Very rank in mist of the fall; altitude 5000 feet (?). Common down to Ashford.

3. Cheilanthes Feei Moore. In crevices of rocks, Cross Trail, south side of Pinnacle Peak just below the summit; 7000 feet. Rare and small.

4. Cryptogramma acrostichoides R. Br. Among rocks summit of Pinnacle Peak, 7200 feet; (U. S. Eng. Corps). Rare and immature.

5. Struthiopteris spicant (L.) Weiss. In humus; sporadic at 5000 feet in the forest along the trail below Narada Falls.

6. Polystichum lonchitis (L.) Roth, Among rocks, bluffs of the Kautz glacier, 7500-8000 feet. Rare; fruiting fairly well.

7. Woodsia oregana D. C. Eaton. In small holes in rocks, Alta Vista; also bluff a half mile east, altitude 7000 feet. Rare; immature at the time. Altitude of Paradise Camp 5862 feet (U. S. Geological Survey).

Goldendale, Wash.

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ANNOUNCEMENT

A new edition of the Catalog of North American Plants is in preparation. Thus far 68 pages have been printed, and other parts will follow as fast as possible. In all there will be about 300 pages. Since a considerable time must elapse before the work can be completed, the 68 pages and other parts as soon as issued, will be sent to those who wish to have them in that form, for $1.25, payment to be sent with the order.

When completed the Catalog may be had in neat green cloth binding for $1.50 postpaid. Orders for the cloth bound book may be sent in now, payment to be sent when the book is delivered.

A. A. Heller,

539 West 5th street, Reno, Nevada

Volume 5 Number 11

MUHLENBERGIA

NOVEMBER, 1909

Editors: A. A. HELLER and P. BEVERIDGE KENNEDY

Lupinus malacophyllus Greene

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University of Nevada,
Reno, Nevada

Volume 5 December 20, 1909

MUHLENBERGIA

THE NEVADA LUPINES—II

By A. A. Heller

Before taking up the remaining species of the section, I wish to call attention to two errors that were allowed to creep into the preceding number. The first is the statement that Wadsworth is located in Churchhill county. This occurs on pages 139 and 140. Wadsworth is really situated in Washoe county, near the boundary line of Lyon county, which here runs up into a sharp point only a few miles across, intruded between Washoe and Churchhill counties.

The second error is on page 137, where Watson is made to say near "Soda Spring, Candelaria County." The frequent association of Shockley's name with specimens collected at Candelaria, led me to unthinkingly put down this name. Instead of "Candelaria" it should read Esmeralda county.

Lupinus brevicaulis Wats. Bot. King Rep. 53. *pl. 7. f. 1-4.* 1871.

From about 2 cm. to 1 dm. high, widely spreading, the width usually about one and a half times the height: main stem practically none, but several to many secondary branches about 1 cm. long, from which spring the petioles and peduncles, or sometimes other short branches; stems pale, glabrous or nearly so: petioles up to 5 cm. long, somewhat villous-hirsute, about 2 mm. wide at the dilated base; stipules barely 2 mm. long, bearded; leaflets 5 to 8, broadly oblanceolate, up to 15 mm. long, 5 mm. wide, obtuse, glabrous above, somewhat villous-hirsute beneath in age, decidedly so when young: peduncles pubescent like the petioles, usually about three times longer than the short

racemes, the whole barely equalling the leaves: racemes 2 cm. long or less, dense: flowers bright violet-blue, 7 mm. long, 4mm. deep: bracts green, lanceolate-linear, slightly over 2 mm. long, villous-hirsute, as are the pedicels and calyx: pedicels about 2 mm. long when in fruit: calyx with very unequal lobes, the upper practically obsolete, represented by a bractlet on either side; the lower lobe entire, 1 or 2 mm. shorter than the flower: banner somewhat rhombic-elliptic when spread out, 7 mm. long, 3 mm. wide across the middle, in nature the edges apparently somewhat turned back but not parallel; wings probably only moderately inflated, open on the lower side and exposing the keel for nearly its whole length, narrow, only 2 mm. wide; keel 8 mm. long, protruding a little from the wings: pods about 1 cm. long, 6 or 7 mm. wide, somewhat villous, reticulate-veined: seeds somewhat lenticular, 2 mm. across, pinkish, smooth and shining.

The above description is drawn from *Kennedy 1333*, collected at Truckee Pass, Washoe county, and since it answers well to the essential points in Watson's description, I take it to be true *L. brevicaulis*. The calyx is like his *f. 2. pl. 7*, and the banner and keel correspond to *f. 3*, except that the banner in his figure looks rather diagrammatic. His *f. 1*, however, does not look altogether like our plant, and may possibly represent *L. dispersus*. He does not indicate any particular type locality, but says "in the valleys and lower canyons of Western Nevada to the East Humboldt Mountains, (more frequent than the last) [*L. pusillus*] and on the islands of Salt Lake; 5-8,000 feet altitude; May-July. Also collected by Dr. Anderson (84) near Carson City."

Anderson's 84, at least the one on sheet 16008 in the herbarium of the University of California, is *L. malacophyllus*, a totally different plant.

On sheet 41363 in the U. S. National Herbarium, is a specimen collected by Watson in the Coyote mountains in the southeastern part of what is now Humboldt county, in June, 1868. It is labeled "*Lupinus brevicaulis* S. Watson, form," and differs slightly from the plant described above. Some of the peduncles are more elongated, and the lower calyx lobe is not

much more than half as long as the flower. The corolla does not differ.

I have made an effort to see the type of this species, but so far have not been able to do so. The following specimens have been examined:

ESMERALDA COUNTY: Candelaria, *Shockley 51*.

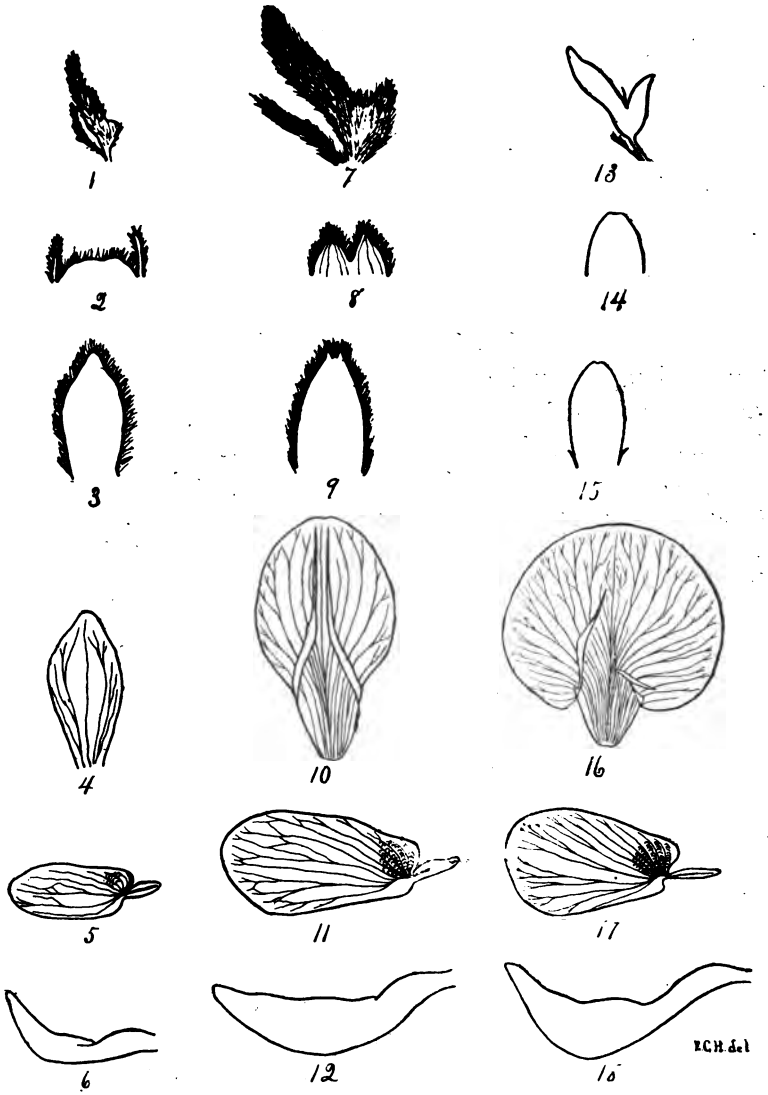
HUMBOLDT COUNTY: Coyote mountains, *Watson 223*.

WASHOE COUNTY: Truckee Pass, *Kennedy 1333; Heller 8646*.

LUPINUS MALACOPHYLLUS Greene, Pittonia **1**: 215. 1888.

Plate 4. f. 7-12

Plant 1 to 1.5 dm. high, at first with a single flowering stem, at length sending out several horizontal branches which are decumbent at base, as long as the ascending ones, giving the plant a spread of twice the height; pubescent throughout except the upper surface of the leaflets with long and soft spreading white hairs about 2 mm. long: leaves up to 6 cm. long, two-thirds of which is petiole; leaflets 5 to 7, obovate-lanceolate, obtuse, the largest 15 mm. long, 7 mm. wide, equally green on both surfaces: racemes commonly exceeding the leaves from the first, 6 or 7 cm. long when mature, verticillate, at least below; peduncles about equalling the racemes: pedicels 2 mm. long: bracts green, subulate, 5 to 7 mm. long: upper calyx lobe barely 2 mm. long, scarious except at the greenish, 2-toothed apex; lower calyx lobe 8 or 9 mm. long, shortly 3-toothed; a subulate green bractlet 1 mm. long in the sinus: flowers white tinged with purple, often drying bluish, about 13 mm. long and as deep, 5 mm. broad, a space of 8 mm. between apices of banner and wings; banner yellowish on the face, marked with purple dots in the groove, apex very shallowly notched, sides reflexed and the edges almost parallel except at the slightly flaring base, where they are 5 mm. apart; wings moderately inflated, 5 mm. wide across the middle, oblique below the apex and exposing the keel, closed along the upper edges: keel a little over 2 mm. wide across the elbow, glabrous: pods about 15 mm. long, 5 to 6 mm. wide, villous like the stem and leaves, 2-seeded: seeds pale brown or reddish when mature, or sometimes whitish, somewhat lenticular-ovoid, about 3 mm. wide and slightly longer.



Lupinus brevicaulis: 1. Calyx; 2. upper calyx lobe; 3. lower calyx lobe; 4. banner, 5. wing; 6. keel.

Lupinus malacophyllus: 7. Calyx; 8. upper calyx lobe; 9. lower calyx lobe; 10. banner; 11. wing; 12. keel.

Lupinus odoratus: 13. Calyx; 14. upper calyx lobe; 15. lower calyx lobe; 16. banner; 17. wing; 18. keel.

The type was collected by C. F. Sonne on "dry hills near Verdi, Nevada, 2 May, 1888." Verdi is situated about ten miles west of Reno on the Truckee river. The plant is plentiful on gravelly hills about Reno, beginning to bloom in the latter part of April and usually lasting well into June. It is probably of local distribution, for with one exception all of the specimens examined have been collected within ten miles of Reno. The exception is Anderson's 84, collected near Carson.

In Bulletin 24 of the Nevada Agricultural Experiment Station, entitled Early Flora of the Truckee Valley, by F. H. Hillman, this species is described under the name of *L. pusillus*, and is given as "common, often in patches." It is apparently the only species of this section found in the Great Basin which has a more or less verticillate inflorescence. It is a handsome little plant, well worthy of cultivation. The following specimens have been examined:

ORMSBY COUNTY: Carson, *C. L. Anderson 84* (labeled *L. pusillus*).

WASHOE COUNTY: Verdi, *Sonne 27* (type); Reno, *Jones*, 1882 (as *L. pusillus*); June 10, 1897 (as *L.* "*breviflorus* Wats.;" *Miss Stokes*, June 21, 1900 (as *L. pusillus*); *Brandegee*, May, 1883 (as *L. brevicaulis*); *Hillman*, September, 1890 (labeled *L. Kingii*, and annotated by Jones as "*Shockleyi* W." on sheet no. 20976 in the U. S. National Herbarium); *T. W. Cowgill*, May 13, 1901; *Kennedy*, May 4, 1901; *Heller 9696;* hills ten miles north of Reno, *Heller 8659*.

Lupinus flavoculatus

Plate 5

Annual (section Platycarpos), depressed, usually only 5 or 6 cm. high, nearly acaulescent, the leaves and flowering stems decumbent for about half their length, the latter averaging about 1 dm. in length (some of them occasionally runner-like, 2 or 3 dm. long): petioles yellowish, the largest 5 to 8 cm. long, villous with stiffish white spreading hairs about 2 mm. long: leaflets about 8, obovate-oblanceolate, up to 15 mm. long, 7 mm. wide, yellow at base, the whole forming a yellow eye to the leaf,

Muhlenbergia, Volume 5 Plate 5

glabrous above, villous below like the petioles, but less so, the margins ciliate: peduncles purplish, commonly equalling the leaves when mature, villous: racemes 6 cm. long or less: flowers not verticillate, rather dense, of a rich deep violet-purple, 1 cm. long and as deep, 7 mm. between apices of banner and wings: bracts 3 mm. long, subulate, purplish at first, fading brown, bearded with stiffish hairs: pedicels 2 mm. long, pubescent: calyx tube glabrous, bright green as are both lobes at blossoming time, but the upper turning paler with age, 2 mm. or a little more in length, 2-parted, ciliate on the edges, the body glabrous; lower lobe 5 or 6 mm. long, 2-toothed, the teeth 1 mm. long, a tuft of hairs in the sinus, pubescent externally as well as ciliate on the edges: banner marked on the face with a quadrate spot of bright yellow 2 mm. across, this fading brownish in age, apex notched, 3 mm. wide, sides reflexed but the edges not parallel, the space across the flaring base 6 mm. wide; wings much inflated, the edges 4 mm. apart at base, exposing the keel to a little above the point of curvature, the blade rhombic-obovate when spread out, 7 mm. long, 4 mm. wide; keel glabrous, somewhat bow shaped dorsally, but little curved ventrally: pods ovate, 1 2mm. long, 7 or 8 mm. wide, pubescent, but not densely so, 2-seeded: seeds pinkish, about 2 mm. across, somewhat lenticular in shape, dull and corrugated.

Plate 5. Fig. 1. calyx; fig. 2. upper calyx lobe; fig. 3. lower calyx lobe; fig. 4. wing; fig. 5. keel.

The type, deposited in the herbarium of the Nevada Agricultural Experiment Station, is my no. 9669, collected May 17, 1909, at Rhyolite, Nye county, Nevada, along the northern base of Ladd mountain, growing in sand, the elevation 3575 feet. It is plentiful at a point just beyond the Tonopah & Tidewater station, and extends northward across the level space to and beyond the tracks of the Las Vegas & Tonopah Railroad.

In habit it is much like *L. brevicaulis* and *L. Shockleyi*, but as may be seen from the descriptions and key, differs considerably from both. The deep violet-purple corollas, marked on the banner with a quadrate yellow spot, reminds one of the flower of *L. odoratus*, but in nothing else, for outside of color none of the characters are identical.

Besides the type collection I have seen one other from Nevada. *Goodding 942*, collected at Caliente in the Meadow Valley Wash, Clark county, labeled *L. brevicaulis*, is this species. In some cases, however, plants of *L. dispersus* have been included under this number, but may be easily recognized by the denser pubescence, and much smaller, pale flowers.

Two collections from California have been noted. The first is *Coville and Funston 977*, labeled *L. brevicaulis*, from Boundary canyon Grapevine mountains, Inyo county, just over the line from Nevada, and not many miles southwest of Rhyolite. The second, also labeled *L. brevicaulis*, is *Purpus 5714*, from "[illegible], South Fork of Kern River, Calif., alt. 2-3000 f." [illegible] the western slope of the Sierra Nevada, and is a rather remarkable extension of the range. The specimen examined is no. 82241, herbarium of the University of California. On the same sheet (Brandegee Herbarium) are two more specimens, one of them an undeveloped state of *L. odoratus*, while the other may be undescribed.

Still another collection is *Jones 1657* from St. George, Utah, April 13, 1880. The plants are young and not well developed, but are undoubtedly this species.

LUPINUS ODORATUS Heller, Muhlenbergia **2**: 71. 1905.
Plate 4. f. 13-18

Somewhat fleshy, 1.5-2.5 dm. high: leaves basal; petioles 8 cm. long or less, stout, somewhat villous; leaflets commonly 9, oblanceolate, 2 cm. long or less, 7 mm. wide below the rounded but acutish apex, bright green, at first villous but becoming glabrous except for the few tufts of hairs at the apex: scape-like peduncle yellowish: inflorescence 5 or 6 cm. long: bracts linear-lanceolate, 2 or 3 mm. long, with a tuft of long hairs at the apex: pedicels slender, 6 mm. long, ascending, glabrous, readily disarticulating from the stem: flowers pleasantly scented, deep violet-purple except for a yellow quadrate spot on the face of the banner, about 1 cm. long, 8 mm. deep: calyx dull green, the lobes entire, the upper 2 mm. long, the lower 4 mm. long; a small bractlet 1 mm. long in the sinus between the lobes: banner broad (1 cm.), the edges only slightly turned back, presenting a scoop-

like appearance viewed from the back; wings inflated and open below, the opening ovate, nearly 3 mm. wide, the upper edges meeting; keel not protruded from the open wings, rather strongly curved, 3 mm. wide for about two-thirds its length, then tapering to the acute apex: pods yellowish, 1 cm. long, 6 mm. wide, oblique at either end, ventral margin with a fringe of long hairs: seeds grey, wrinkled, about 2 mm. in diameter.

Sheet 20973 in the U. S. National Herbarium bears a specimen of this species. On the label is the legend "Lupinus brevicaulis fide S. W. Locality, Great Basin, Nevada. Collector, J. G. Lemmon, 1875." Written above the label is "Shockleyi W. M. E. J."

The species has nothing in common with either *L. brevicaulis* or *L. Shockleyi*, being equally far removed from both, as may be seen from the descriptions, key, and illustrations, differing totally in appearance and having no characters in common with them other than that it is a lupine of the Platycarpos section.

Mr. Lemmon's locality is rather vague, and it is quite probable that he really collected the plant on the Mojave desert, California, where the type was collected, and where it has been found at a number of stations. But it should be looked for in southwestern Nevada. I have seen it at the upper end of Owen's valley near Benton, not far from the Nevada line, and it may occur in the region adjacent to Death valley.

Mule Ears

This common name for *Wyethia mollis* Gray, as used by the Editor of MUHLENBERGIA in the issue for September (**5**: 131) is, it seems to me, a better form than that which is cited in the writer's Flora of Western Middle California, 541. 1901, where the form Mule's Ears is indicated as the common name equivalent of *Wyethia glabra* Gray. Both forms are doubtless used by the folk and applied indifferently to any Wyethia species with broad, pointed leaves, including the species *Wyethia helenioides* Nutt.—WILLIS L. JEPSON.

RECENT LITERATURE

LABORATORY BOTANY by Willard N. Clute. Ginn and Company, Boston. 1909.

This neat little book of 177 pages is designed primarily for use in high schools. I can probably give no better idea of its usefulness than by quoting freely from the preface and introduction, and by enumerating the subjects listed under the head of contents.

"The object in issuing this little manual is to furnish high-school teachers and students with a set of definite questions covering a year's work in botany that will at once direct the student to the structures he is to investigate and relieve the teacher of much of the labor of directing such investigations. No apology, therefore, is offered for the many and detailed questions, somewhat extended experience with high-school pupils having demonstrated that without specific questions the average pupil is likely to omit many points which should be studied.

"By the use of this or a similar list of questions, a great deal of laboratory botany "teaches itself," leaving the teacher with time to prepare such materials as are needed, to set up and take down apparatus, and to assist such pupils as may be in need of help. If desired, it is quite possible for any student, with this book in hand, to work through the course for himself, taking as much or as little time each day as he can spare from other studies. In class work also, the questions will be found to conduce to a certain independence of the pupil, and prevent to a considerable extent the copying of one from another.

"In preparing the questions an effort has been made to word them so that the pupil will be obliged to carefully examine for himself the structures studied in order to obtain the answers. Instead of requiring him to verify a set of statements (which he is usually willing to accept without question), he is obliged to observe, compare, and reason. No question is asked that can not be answered from a study of easily obtained material. The questions have been so arranged that if answered in their order, the written work should make a fairly clear and logical presentation of each subject."

"In the author's opinion everything in the course in botany that can be studied in the field or laboratory should be so studied. In no other science is there less need for extended recitations, or in the high-school course at least; for reference work of any kind. The permanent notebook should be entirely a record of what the student has observed in the laboratory, aud the recitations, held after the laboratory work is completed, should aim to bring this knowledge into proper relation with such facts as must of necessity be obtained from the text-book.

"The course is designed to cover a year's work in the laboratory, and falls naturally into two divisions—one devoted to the structure and life processes of angiosperms, the other to the structure and evolution of the whole plant kingdom."

The book is divided into three parts. Part one deals with "the structure and life processes of angiosperms," under twelve headings: To the student; exercises with the microscope; cells; seeds; roots; bulbs; stems; leaves; flowers; fruits and seeds; the study of trees—a key to our common trees; ecology of the flower—some plant adaptations. This part ends on page 88, and contains many questions relating to the structure, mode of growth, uses, and adaptation of the different parts of a plant.

The second part, pages 89 to 157, deals with "the structure and evolution of the plant kingdom." Beginning with the algae some of the simpler forms in the great groups of thallophytes, bryophytes, pteridophytes and spermatophytes are studied in such a way that the most instructive and interesting facts concerning them are fully brought out.

The third part consists of thirty-six experiments as follows: To discover some of the properties of protoplasm; whether chlorophyll is a pigment; the effect of sunlight upon the production of chlorophyll; how much water a given seed will absorb in germination; where the water enters the seed and the path it takes within; whether seeds exert force in absorbing water; whether seeds need light in order to germinate; whether seeds make use of any part of the air in germination; whether seeds give off heat in germinating; whether seedlings are able to exert force in growth; what guides the young shoot upward and the root

downward; whether moisture or gravity has the greater influence upon the direction of growth in roots; to illustrate the law of osmosis; to discover whether water will readily pass through the epidermis of roots; whether water will readily pass through the walls of the root hairs; through what part of the root the moisture travels upward; where roots increase in length; what part of the root is able to turn; whether roots excrete acids; where the stem grows in length; in what part of the stem the sap passes upward; the path of the elaborated plant food in the stem; whether cell turgor aids in keeping the leaves expanded; whether tissue tension aids in holding petioles erect; whether the absorption of water can cause change of position in parts of plants; whether leaves transpire; whether water is given off by the stomata; whether leaves can control transpiration; whether more moisture is ever sent to the leaves than they can transpire; whether plants respire; whether plants give off gases in sunlight; to test the gas given off by plants in sunlight; where the gas given off by plants in sunlight is obtained; whether sunlight has any effect upon the formation of starch; whether chlorophyll has any effect upon the formation of starch; whether plants withdraw the starch made in the leaves.

The book should have a wide field of usefulness in high school work, and no doubt will do much toward creating a lasting interest in the study of plant life.—A. A. HELLER.

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A. A. Heller,

539 West 5th street, Reno, Nevada

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Editors: A. A. HELLER and P. BEVERIDGE KENNEDY

Feather Grass (*Stipa Thurberiana* Piper)

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STUDIES IN TRIFOLIUM V.

By P. Beveridge Kennedy

Notes on T. longipes Nutt.

A photograph of the type sheet of *Trifolium longipes* from Kew reveals some interesting botanical history.

For a number of years the writer in his studies of the clovers has been troubled with the apparent discrepancies between the plants generally considered *T. longipes* and the original description. There are three plants on the type sheet marked *longipes*. One a short one from the Rocky mountains, and two others, one with a very long peduncle and slender flower head from the Columbia plains.

The original description cites "valleys of the central chain of the Rocky Mountain range, and on the moist plains of the Oregon as low as the Wahlamet." The description also indicates that it includes both the Rocky mountain plant and that of the Columbia plains. The flowers are said to be "ochroleucous."

The fact that the smaller plant comes from the Rocky mountain range and that the flowers are yellowish would indicate that it is *T. Rydbergii*. The flowers are evidently too young to be reflexed, a strong character distinguishing *T. Rydbergii* from *T. longipes*. A great many of the plants collected in the central chain of the Rocky mountains through Colorado, Utah and Wyoming, although usually marked *longipes*, on examination prove to be *T. Rydbergii*.

Hooker, in London Journal of Botany **6**: 209, while reporting on Geyer's collection, places a *Trifolium* from the stony banks of Flathead River [Montana] with white flowers under *longipes*. It is probably *T. Rydbergii*.

Plate 6

Type sheet of *Trifolium longipes* in the Kew Herbarium, London

The impression seems to prevail in literature that *T. longipes* has rather slender running roots and rootstocks only, and that all plants in the herbaria with long stout tap roots must belong to some other species. We have given considerable attention to the root characters of this species in the field, and are convinced that it has numerous slender running rootstocks and descending from these at irregular intervals long stout tap roots. The collector, unless especially studying the root characters, will dig down a few inches and bring up the small roots and rootstocks only.

The species also varies very greatly in regard to the form of the leaflets and other characters, depending upon the conditions under which it is growing:

1. (See *pl. 7. f. 1-2.*) If the soil is sandy and sterile and the plant in the shade, the leaflets, stems and peduncles are very slender.

2. (See *pl. 7. f. 3.*) If growing in irrigated meadows, cut for hay along with native blue grasses and sedges, the lower elliptical and semi-orbicular leaflets are smothered and the upper ovate-lanceolate, either acute or obtuse ones are well developed.

3. (See *pl. 7. f. 4.*) If in gravelly soil with plenty of room and exposed to conditions of drought during the hot summer months, the plants are strongly pubescent and the upper leaves narrower, but an abundance of short petioled semi-orbicular leaflets at the base. This form has been mistaken for *T. Rusbyi*, but the flowers have very short pedicels and do not reflex in age.

4. (See *pl. 7. f. 5-6.*) These plants were collected and studied within a few yards of one another, and undoubtedly represent the same species. The smaller ones (*f. 5.*) were dug out of sod in a meadow which is grazed severely by sheep every season, and where the water level is close to the surface for the greater part of the year, preventing the descent of the long tap root, as we find it here short and thick. The leaflets in some of the plants were narrow and some broad, apparently under the same conditions. Likewise the flowers varied from white, white shaded with light purple, to purple and red.

Plate 7

Variations of *Trifolium longipes*

Figure 6 represents the typically developed plant with long lower petioles and elliptical leaflets, upper leaves with short petioles and linear-lanceolate leaflets. The plant also shows the slender roots and rootstocks, and the long tap root which is usually broken or cut off in herbarium specimens. This plant was growing among rocks on a bank at the edge of the meadow in good soil, protected from grazing, and with plenty of room and good drainage.

The distribution of the species, so far as we have been able to trace it, would seem to be from Washington, Oregon and Idaho to northern California, thence down the Coast Range to the northern part of Lake county, passing through California by the Sierra Nevada ranges only, and extending along the mountains in western Nevada. Some specimens not *T. Rusbyi* or *T. atrorubens* would indicate that it also occurs in the San Bernardino mountains in southern California.

The plants referred to in Synopsis of the Flora of Colorado, by Porter and Coulter, page 20, under *T. longipes* are undoubtedly *T. Rydbergii.*

An examination of the type collection of *T. Rusbyi* shows that previous writers are mistaken in extending its range to the Sierra Nevada mountains in California and Nevada. Typical *T. Rusbyi* from Arizona is quite distinct from the others, especially in regard to the reflexed flowers.

Nevada Agricultural Experiment Station.

FEATHER GRASS

By A. A. Heller

Stipa Thurberiana Piper, U. S. Dept. Agric. Div. Agrost. Circ. **27**: 10. 1900.

Stipa occidentalis Thurber, U. S. Expl. Exped. **17**: 483. 1874. Not *Stipa occidentalis* Thurber, Bot. King Rep. 380. 1871.

This is the species to which the manuscript name of *occidentalis* was originally applied, the specimen upon which it was based having been collected by the botanists of the Exploring Expedition under Captain Wilkes on the "North Branch of the Columbia and Okanogan," but its publication was delayed for a number of years. In the meantime the botanical report of the King Expedition was published, and going on the supposition that the same species was at hand, Watson printed the name *occidentalis*, crediting it to Thurber, but citing first a plant collected by Bolander in the Yosemite Valley, California, this thereby becoming the type. Unfortunately, though, it proved to be different, as pointed out by Piper in the place cited above. The two species may be readily separated by the difference in the awn, that of *occidentalis* being pilose below and scabrous above, while that of *Thurberiana* is strongly plumose both below and above.

As shown in the cover illustration, taken by Dr. P. B. Kennedy in December, 1904, in the Rock Springs Range several miles north of Reno, it forms extensive clumps, and this in connection with the fact that it persists through the greater part of the winter, makes it a valuable winter forage plant, particularly for sheep.

In Bulletin **33**: 9, of the Nevada Agricultural Experiment Station, F. H. Hillman, speaking of its occurrence in the vicinity of Reno, says it "is the commonest of our species of this genus in this region. Nowhere does it grow thickly, but its very general distribution over the ranges on a variety of soils makes it a grass of considerable importance. Its small bunches of leaves, six inches or more high, surround several stems, rising

to a height of one or two feet, their rather woody structure permitting them to mark the locality of the plants until late in winter."

On page 8 he further remarks concerning several species of the genus:

"*Stipa* is the generic name applied to several kinds of grass closely related to those of *Oryzopsis*, and commonly called feather grass. Various kinds of these feather grasses are found growing spontaneously over a great portion of the western country, where they contribute much to the native forage.

"Four kinds of feather grass are found in the immediate neighborhood of the Truckee Valley. The one of these seemingly most valuable is that least generally distributed. This is *Stipa speciosa*. It commonly frequents rocky situations, such as the rocky points crowning the hills. Here it forms dense stools several inches in diameter. Another wholly different situation in which the species has been observed is that of a gravelly hillside.

"The stools show great age, evident in their size and the immediate situations in which they are found. They are often a foot in diameter (large for this genus); and, unlike allied species, the stools are usually closely associated with one or another of the shrubs of the vicinity. This fact, taken in connection with that of the proximity of these plants to the rocks of the open hills, indicates a dependence upon some fixed object having power to retain a certain amount of moisture while the stools are becoming established. An indication of the plant's ability for self-support, when once established, is exhibited by strong stools occurring in open spaces. An examination of such stools, however, shows, in almost every instance, the decayed remains of some former shrub, long survived by the grass once protected by it.

"The large stools produce a dense tuft of fine, moderately stiff leaves, standing a foot or more high. These are slightly exceeded by the rather fine stems, which produce narrow flower clusters. The quantity of seed produced is not large."

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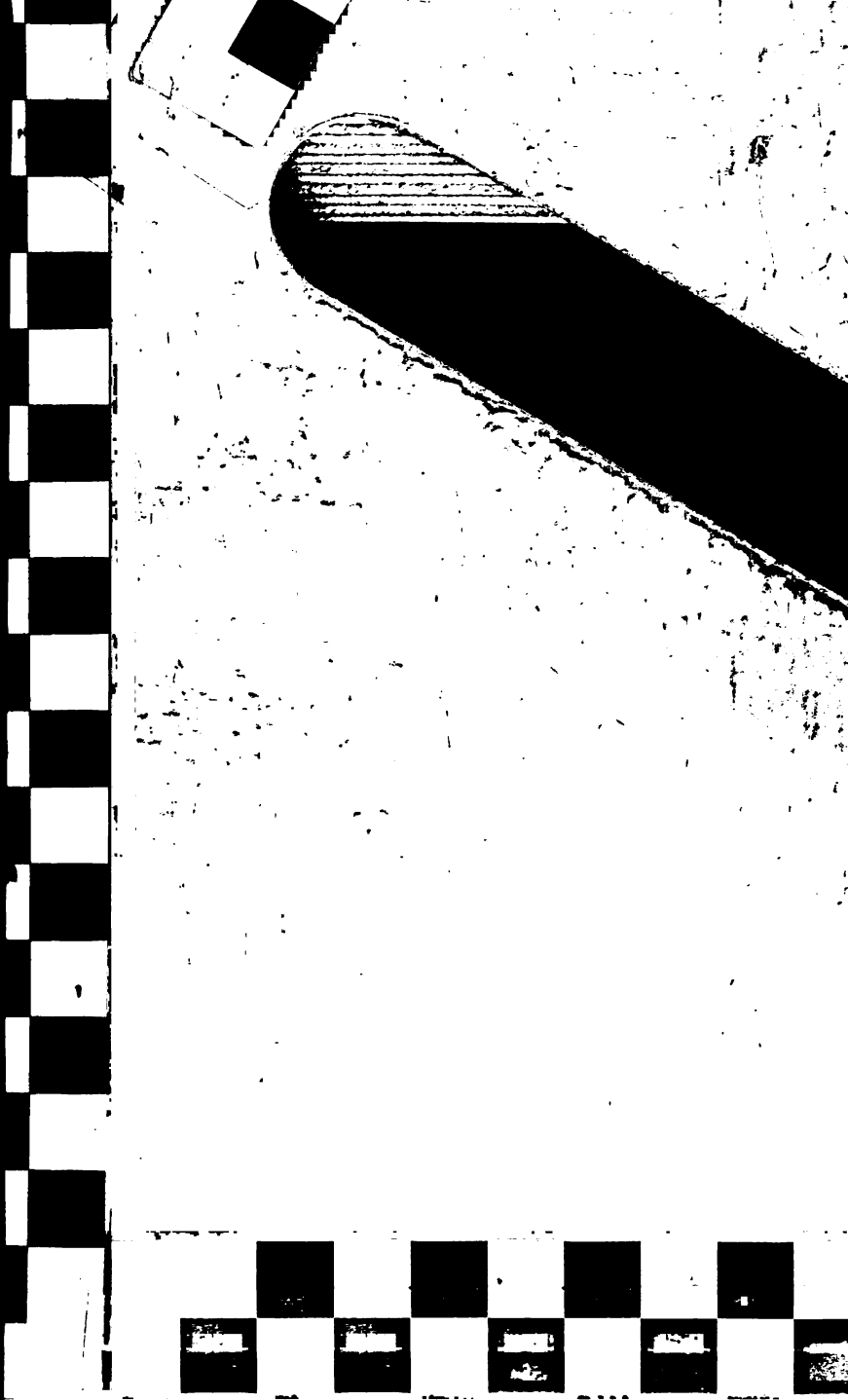
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